MARCH, 1950 PRICE, $1.00

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The Shop Teachers' Professional Magazine

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

SCHOOL SHOP ANNUAL

This reveals the hidden truth

Photo courtesy International Minerals & Chemical Corporation

WHEN two steaks from the same cut are broiled, one "as is," the other sprinkled with Monosodium Glutamate, the difference in taste is momentous. It is hard to believe the two steaks are the same meat.

When two youngsters from the same "cut" are brought to adulthood, one "as is," the other sprinkled with the MSG of inspired teaching, the difference is momentous. It is hard to believe the two boys are from the same flesh.

The above points out an amazing truth. Both steaks possess the same *intrinsic* flavor. But it takes this new *agent* to fully bring it out. Both *youngsters* possess the same intrinsic qualities that make for success. In the one case, the opportunities that lie at every hand are pointed out, the corresponding qualities in the boy are pointed out, the road between potential and opportunity is pointed out. In the other case, *they are not*. Tragic, isn't it, to think that for the want of a bit of understanding, a bit of inspiration, a bit of the right guidance at the right moment, the *rights* of one boy are jeopardized and lost.

What are the influences, the understandings, the inspirations needed? They too lie concealed, *in the events of the day,* and their essence and their value can be revealed only by the educator's acuity and perception. For example, the question arises: *what* drafting instruments to get for boys in mechanical drawing class? How can the potential influence of *this* event be good and inspired and inspiring if all that is seen here is just an opportunity to economize, an opportunity to substitute cheapness and carelessness for craftsmanship and thoughtful selection? *Each moment of life, each moment in the classroom,* similarly has its significance, its potential for inspiration as well as desperation. How each moment is handled, how each opportunity is treated determines the caliber of a lad's teacher *and the outcome of the boy's life.*

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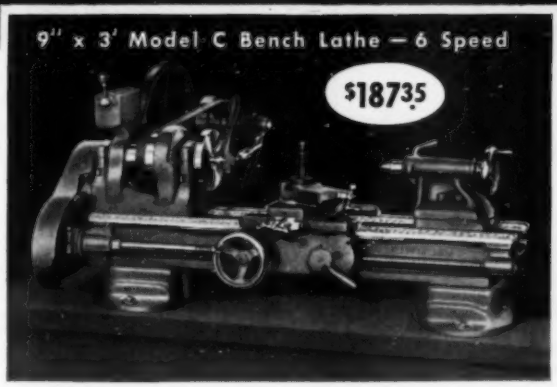

When your equipment budget won't cover all the lathes you need, send for information on South Bend 9" Lathes. They put new life into any budget, yet they're not "cheap" lathes — their low prices are the result of volume production. You get, in these quality-built lathes, almost everything you get in larger, higher priced models: long service, extreme accuracy, wide versatility. All you sacrifice is size — yet they have ample power and capacity for most work done in school shops.

Above prices are f. o. b. factory and include single phase, 60 cycle, 115 volt motors and switches.

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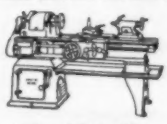
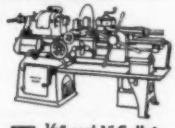
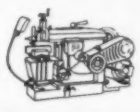
- ☐ LATHE TOOLS and ATTACHMENTS



☐ 10" to 16" FLOOR LATHES



☐ ½" and 1" Collet TURRET LATHES



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For ¾ inch pipe
Clamp Fixtures for ½" pipe, and also wood bars are available.

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Welders Clamps
Openings: 2 to 12 inches

Steel Spindle Hand Screws
Sizes: 4 to 18 inches

Carriage Clamps
Openings: 3 to 14 inches

WRITE FOR CATALOG SHOWING COMPLETE LINE

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, March, 1950, Volume 39, No. 3. Published monthly, except July and August, by The Bruce Publishing Co., 400 N. Broadway, Milwaukee 1, Wis. Entered as Second-Class Matter January 2, 1914, at the Post Office at Milwaukee 1, Wis., under the act of March 3, 1879. Subscription price in the U. S., Canada, and countries of the Pan-American Union, $3.00 per year; Foreign, $3.50; Single copies, 35 cents.

16" BAND SAW
8 blade speeds. Single speed models for wood and plastic cutting. Other models for metal cutting. Table: 18" x 17"

JOINTER
Knives 6" wide (3) Knife guard provides ample protection. Big tables—over 7" wide and 37½" long. 11,700 cuts per min., with 3450 r.p.m. motor. Cutterhead is solid steel, ground and dynomically balanced.

JIG SAW 4 operating speeds. Patented blade tensioner makes possible rapid blade changing. Saw guide and hold down easily adjusted to all thicknesses of work. Throat capacity: 24"

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Gap-bed type with full ball bearing head stock. No. 2 Morse Taper centers. Speeds from 300 to 2600 r.p.m. according to size of pulley used. Height 47", width 11½", length 58".

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Complete cutter guarding for accelerated work speed. Belt and pulleys completely guarded. 3" vertical spindle travels on dovetailed ways. Two speeds: 7000 and 11,000 r.p.m. Table: 22" x 33"—milled slot for miter gauge ¾" x 13/32".

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12" TILTING ARBOR SAW
Capacity: 4½" Saw speed: 3600 r.p.m. Table: 48" x 38¾" New rip fence locks front and rear. New improved safety guard and splitter.

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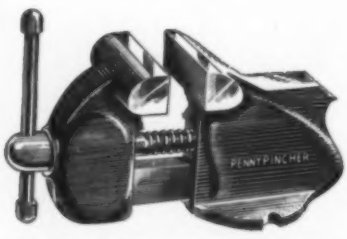
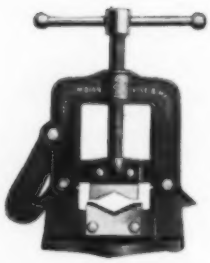
for many varied uses

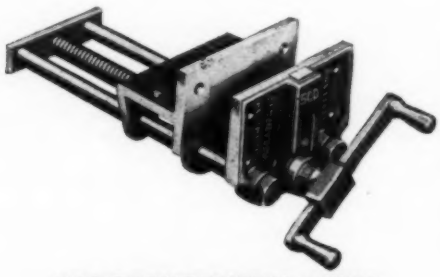
There is a Columbian Vise for every need and purpose — all are made to the highest standard of workmanship and engineering.



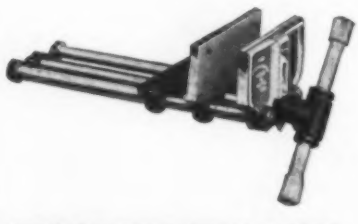
"PENNYPINCHER" VISES
Columbian meets the demand for the low-priced vise with the Columbian "Pennypincher." Jaw width 3½", jaw opening 3", stationary base, weight approx. 9 lbs.



HINGED PIPE VISES
Columbian Malleable Iron HINGED PIPE Vises have self locking unbreakable hooks, tool steel pipe jaws, cold rolled steel screws and handles. Sipes for holding pipe from ⅛" up to 12". Every maintenance department should have one.



WOODWORKERS' VISES
Continuous Screw — Rapid Acting Columbian Woodworkers' Vises are finding increased uses in many plants particularly for the more ordinary types of pattern work. These durable low cost vises are sturdily built with jaw openings up to 12 inches.



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Simple rapid acting mechanism. A slight turn of the handle engages threads of the nut and screw. A half turn tightens the vise to the work. Made in all popular sizes with jaw openings up to 12 inches.

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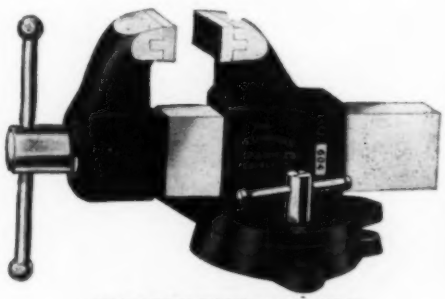
Simple, two pedal foot control leaves both hands free. 3½" jaw widths and 6" jaw openings. Precision manufacturing and tested quality guarantee positive operation and dependable power. Saves time — speeds production — accurate work position.



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Columbian Malleable Iron MACHINISTS' VISES are guaranteed unbreakable! In addition to their exceptional strength, Columbian engineering has built nto these vises the finest mechanical perfection and special features appreciated by users. Made in all standard sizes — 3" to 8" jaw widths equipped with replaceable tool stetl jaw faces.

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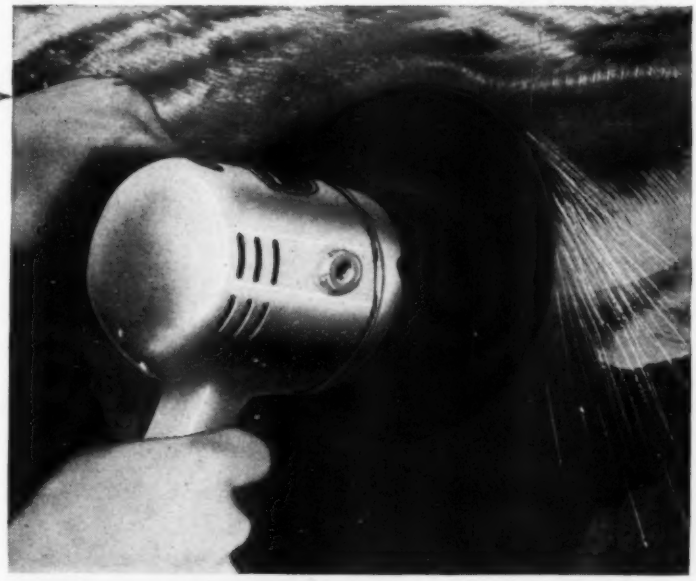

SPEEDS UP INTERMITTENT SANDING, GRINDING, RUBBING, CLEANING! Universal motor in line with spindle and "right angle" handles give this new Black & Decker Sander perfect operating control, better balance, greater compactness. Ideal for touch-up jobs and working in close quarters. Weighs only 8 lbs. Switch and bearings sealed against dirt. Choice of three other B&D Sander models for heavier duty (7" and 9" disc diam., from $67.00).

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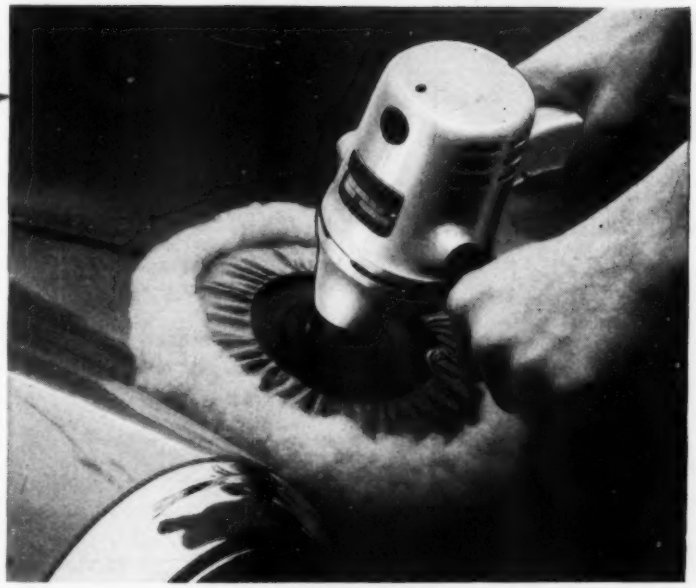

SAVES TIME IN INTERMITTENT POLISHING, WAXING, RUBBING! Same design features as 7" Junior Sander for easy handling. Same quality construction throughout for long life, smooth running—heat-treated gears, grease-sealed ball bearings, etc. B&D Polisher line also gives you your choice of *exclusive* Automatic 7" model ($82.00), which feeds polish to the work automatically; and 7" Standard model ($68.00) for continuous work without automatic feature.

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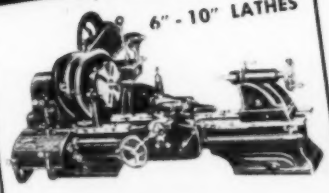
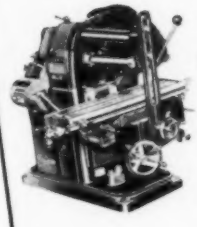
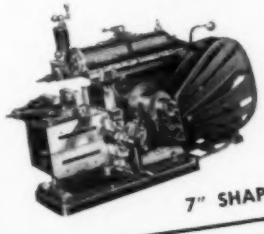
INDUSTRIAL QUALITY TOOLS at Prices Within School Budgets

METALWORKING





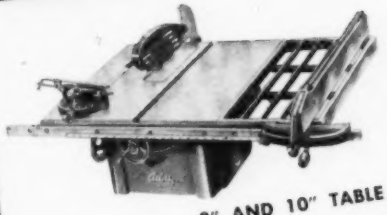


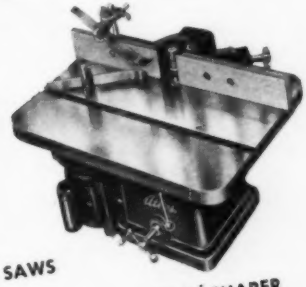
Atlas

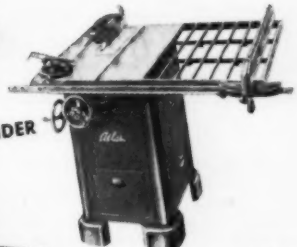
There are many ways Atlas tools can be helpful when you plan for equipment expansion or replacement. If shop space is limited, compact Atlas tools give you more pupil stations in the available space. Atlas quality construction will win commendation from those who expect you to buy tools for many years of good service.

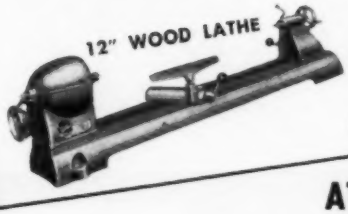
Best of all, Atlas low prices enable you to buy *more tools* for your equipment dollars so that *more students* have opportunity to get sound operational experience. When you plan for next term, make sure you have the latest Atlas catalogs as a guide in determining your recommendations and requisitions.

WOODWORKING









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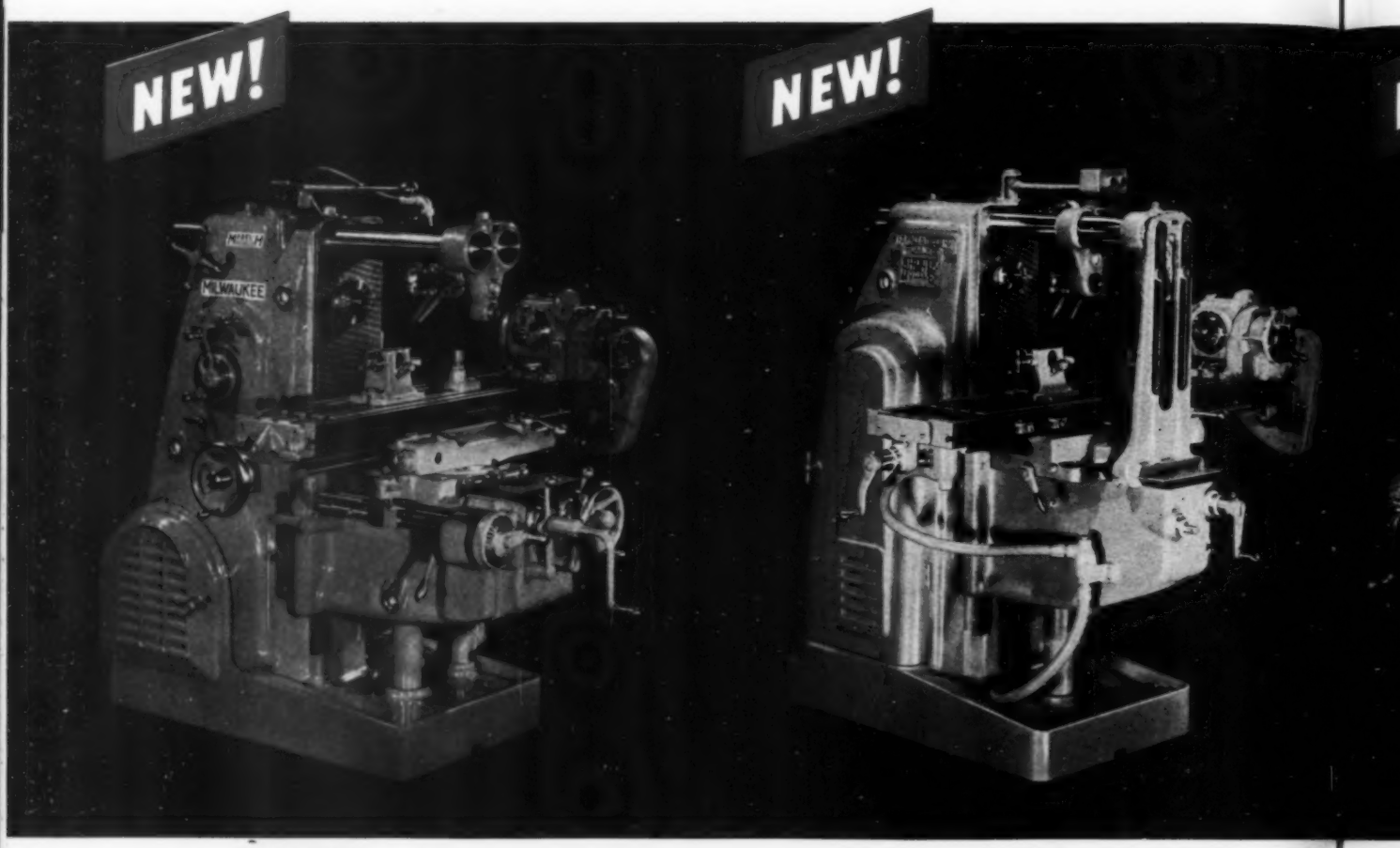

Model 2H Universal

IF YOUR vocational classes are to give thorough training in modern milling methods, you'll want a Kearney & Trecker Model 2H Universal milling machine. It provides centralized controls, broad feed and speed and wide working range . . . factors valuable to installations where space is limited and a variety of work must be accomplished. Safety protection includes interlocking controls, spring-actuated dials, totally enclosed motor and wiring. That means students get instruction under safest possible conditions. Write for catalog No. H20.

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Because of the rapid improvement of cutting materials,cutting tools and machine designs, progressive schools are now replacing worn-out and obsolete equipment with modern milling machines. These Kearney & Trecker Milwaukee Milling Machines give you every feature of modern milling machine design usually found only on larger-size machines. This fact alone has proven of exceptional value in all phases of vocational instruction — and in particular in the most advanced stages of applying modern milling practices. They are low in height and occupy a minimum floor space. Kearney & Trecker Corporation, 6784 West National Avenue, Milwaukee 14, Wisconsin.

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Model 2HL Universal

YOU'RE LOOKING at one of the most popular machines we have ever built for general shop and vocational training purposes—the Model 2HL Universal. This machine features simplified operation with convenient directional controls. It has all the big machine features found on all Kearney & Trecker-Milwaukee milling machines—Solid Back Column, Cross Mounted Motor, Multiple V-Belt Drive, Double Overarms, Automatic Flood Lubrication, "Live" Rapid Traverse and complete Safety Control Interlocks. Write for descriptive Bulletin H13-A.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Get these helpful training books — Book One — "Right and Wrong in Milling Practise" and Book Two — "The Milling Machine and Its Attachments" PRICE: 25 Cents each.

Here are a Few of the Schools Now Using Kearney & Trecker Milwaukee Milling Machines for Vocational Training

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University of California — Berkeley
Compton Union High School — Compton
University of California — Davis
Fullerton Union High School — Fullerton
Whittier Union High School — Los Angeles
Board of Education — San Francisco
Santa Ana High School — Santa Ana

COLORADO
School District No. 20 — Pueblo

CONNECTICUT
State Trade School - Stamford

ILLINOIS
State Teachers College — Charleston
University of Chicago — Chicago
Englewood High School — Chicago
Washburne App. School — Chicago
Joliet Township High School — Joliet
Moline Board of Education — Moline
Bradley Polytechnic Institute — Peoria
Rockford Senior High School — Rockford
Sterling Tp. High School — Sterling
University of Illinois - Urbana

INDIANA
Alex. Jr.-Sr. High School — Alexandria
Washington High School — East Chicago
Arsenal Tech. High School — Indianapolis
Purdue University - Lafayette
Vocational Education Dept. — South Bend
Gerstmeyer Tech. High School — Terre Haute
Indiana State Normal — Terre Haute

IOWA
Iowa State College - Ames
Davenport Public Schools — Davenport

KANSAS
Labette Co. Com. High School — Altamont
Kansas State Agric. College — Manhattan
Topeka Public Schools — Topeka
Wichita High School — Wichita

KENTUCKY
Theo. Ahrens Trade School — Louisville

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Brookline Manual Training — Brookline
Mass. Institute of Technology — Cambridge
East Boston High School — East Boston
Holyoke High School — Holyoke
Hyde Park High School — Hyde Park
Lawrence Industrial School — Lawrence
Medford Vocational School — Medford
Vocational School — New Bedford

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Dearborn High School — Dearborn
Fordson School - Dearborn
Lowrie Jr. High School — Dearborn
Salena Jr. High School — East Dearborn
Cass Technical High School — Detroit
Chadsey High School — Detroit
Bishop School - - Detroit
Edwin Denby High School — Detroit
Wright School - - Detroit
Redford High School - Detroit
G-M Institute of Technology — Flint
Ottawa Hills School — Grand Rapids
Harrison Park School — Grand Rapids
Union High School — Grand Rapids
Copernicus Jr. High School — Hamtramck
Hamtramck Voca. School — Hamtramck
Jackson High School — Jackson
Central High School — Kalamazoo
Western State Teachers Col. — Kalamazoo
Boys Vocational School — Lansing
Michigan State College — East Lansing
Wilson School - Muskegon

MINNESOTA
School District No. 12 - Ely

MISSOURI
Manual High & Voca. High — Kansas City
Cleveland High School — St. Louis

NEW HAMPSHIRE
N. H. College of Agriculture — Durham
University of New Hampshire — Durham
West Side High School — Manchester

NEW JERSEY
Boys Vocational School — Bloomfield
Central High School — Trenton
Rutgers University — New Brunswick

NEW YORK
New Technical High School — Auburn
Union Free School District — Batavia
North Senior High School — Binghamton
Peckham Vocational School — Buffalo
McKinley Vocational School — Buffalo
Vocational School No. 10 — Dunkirk
Board of Education — Hastings upon Hudson
State Agricultural School — Industry
Jamaica Continuation School — Jamaica, L. I.
Newton High School — Long Island City
Masena High School - Masena
Textile High School — New York
Queens College - New York
Auburn High School — New York
Bronx Vocational School — New York
Franklin K. Lane High School — New York
Geo. Hall Trade School — Ogdensburg
University of Rochester — Rochester
Rochester Shop School — Rochester
Saranac Lake Public School — Saranac Lake
Staten Island Voca. School — Staten Island
Continuation School — Syracuse

LOUISIANA
Sullivan Mem. Trade School — New Orleans

NORTH CAROLINA
University of N. C. — Chapel Hill
Duke University - Durham

OHIO
Timken Foundation of Canton — Canton
East Technical High School — Cleveland
West Technical High School — Cleveland
Collinwood High School — Cleveland
Case School of App. Science — Cleveland
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OREGON
Jefferson High School — Portland

PENNSYLVANIA
Allentown High School — Allentown
Lower Merion High School — Ardmore
Bethlehem Trade School — Bethlehem
Liberty High School — Bethlehem
State Teachers College — California
Vocational Machine Shop — Clairton
Erie East Tech. High School — Erie
Ridley Township High School — Folsom
Franklin High School — Franklin
McCaskey High School — Lancaster
Benj. Franklin Jr. H. School — New Castle
New Castle Trade School — New Castle
New Kensington High School — New Kensington
Arnold Public School — New Kensington
Bok Vocational School — Philadelphia
Dobbins Vocational School — Philadelphia
Girard College - Philadelphia
Hill School - - Pottstown
Reading High School — Reading
Pennsylvania State College — State College
G.A.R. High School — Wilkes-Barre
E. L. Meyers High School — Wilkes-Barre
Wilmerding School District — Wilmerding

TENNESSEE
Crocket Tech. High School — Memphis

VIRGINIA
John Marshall High School — Richmond

WEST VIRGINIA
Stonewall Jackson High School — Charleston
Huntington High School — Huntington
West Virginia University — Morgantown

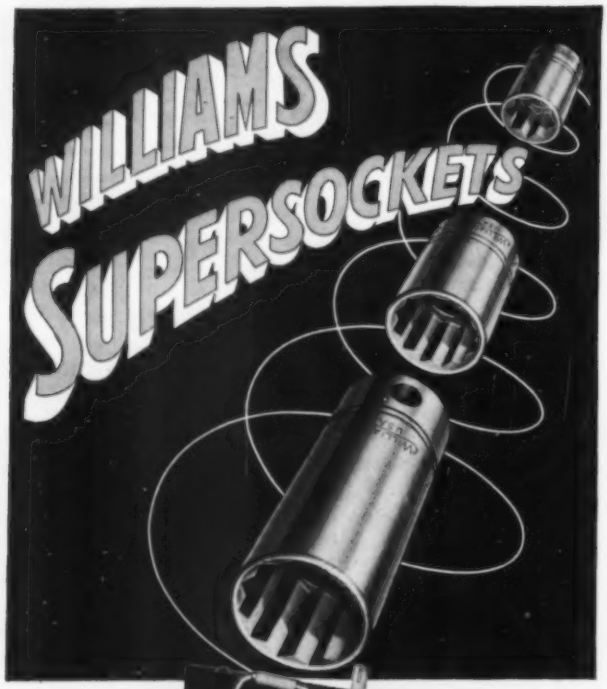
WASHINGTON
Seattle-Edison Voca. School — Seattle

WISCONSIN
Beloit Vocational School — Beloit
Fond du Lac Public Schools — Fond du Lac
Green Bay Vocational School — Green Bay
Janesville Vocational School — Janesville
Kaukauna Vocational School — Kaukauna
Kenosha Vocational School — Kenosha
West High School - Madison
Madison Vocational School — Madison
Marinette Vocational School — Marinette
Boys Technical High School — Milwaukee
Milwaukee Vocational School — Milwaukee
Neenah Senior High School — Neenah
Sheboygan Vocational School — Sheboygan
Two Rivers School of Vocational and Adult Education — Two Rivers
Wausau Vocational School — Wausau
West Allis Public Schools — West Allis
West Allis Vocational School — West Allis
Yerkes Observatory (University of Chicago) — Williams Bay
Wis. Rapids Public Schools — Wisconsin Rapids

ONTARIO
Central Technical School — Toronto
Windsor-Walkerville Technical School - - Windsor

QUEBEC
Montreal Technical School — Montreal
Quebec Technical School — Quebec

PUERTO RICO
University of Puerto Rico — Rio Piedras



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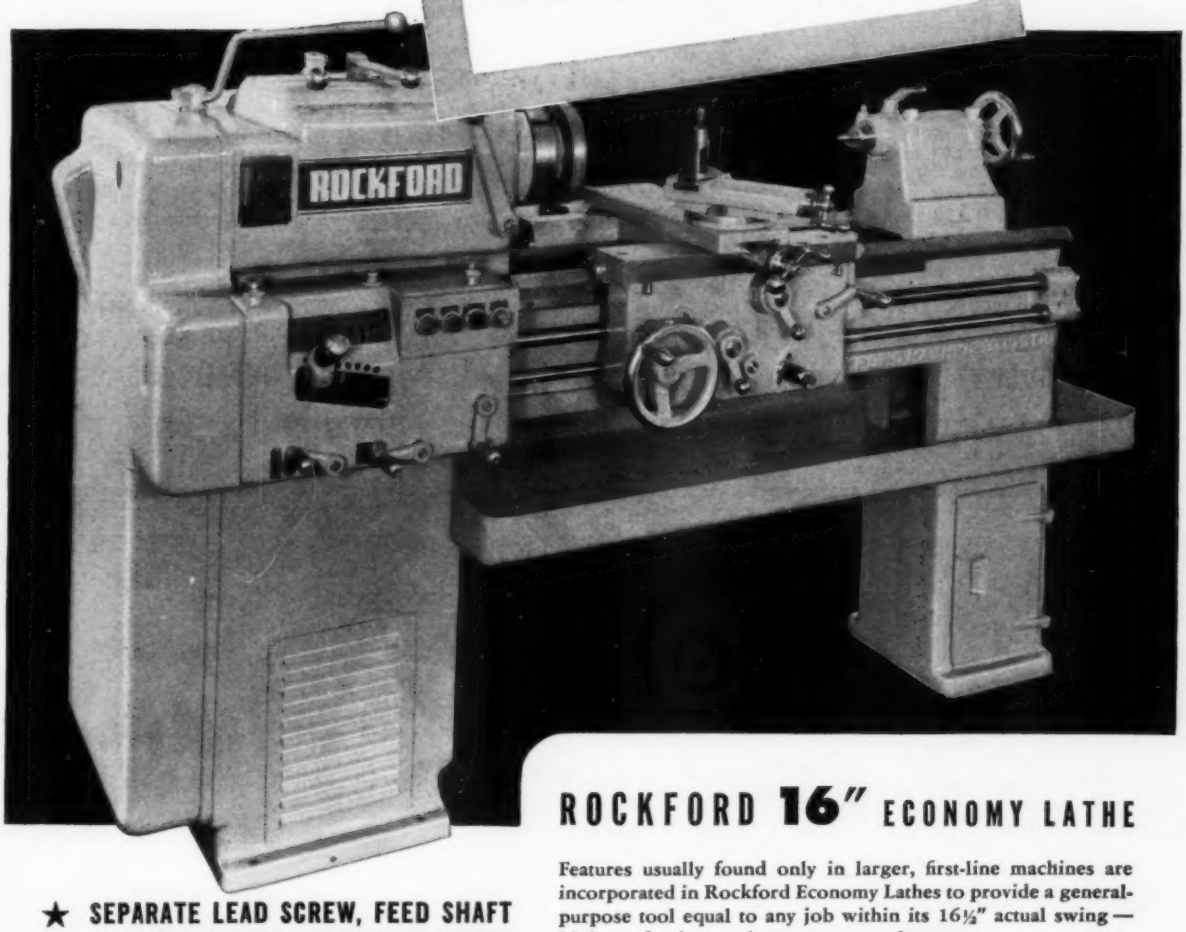

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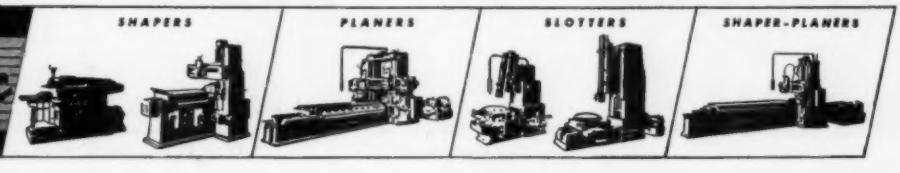

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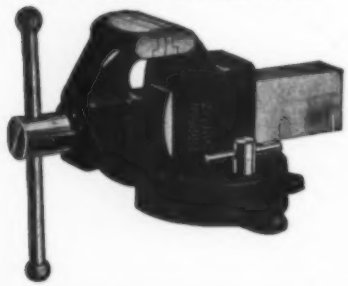

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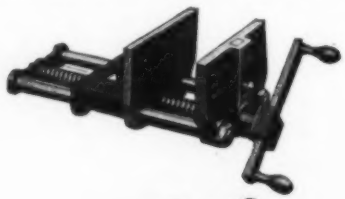

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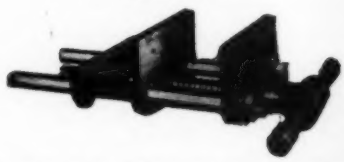

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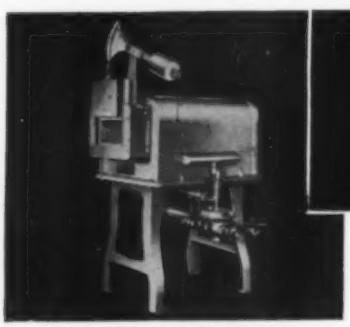

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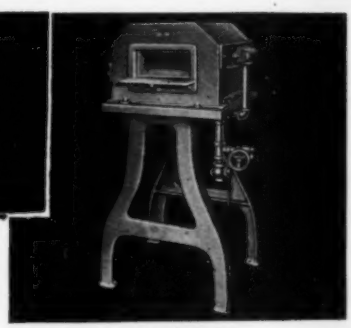

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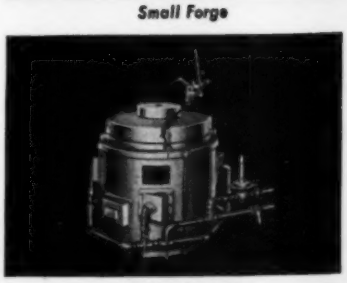

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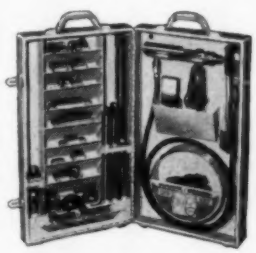

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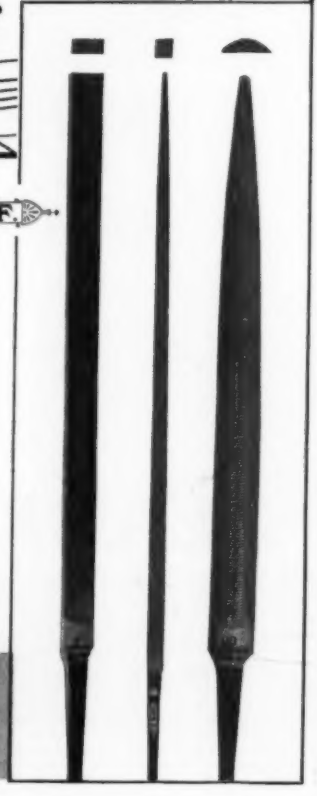

The 1950 Shop Annual

Those interested in shop planning will find many interesting and helpful suggestions in the ten articles on that topic in this issue.

Layouts for unit and general shops, for junior and senior high, and for vocational schools are shown.

There also are several suggestions for tool panels and cabinets, training programs for apprentices, curriculums for a trade and technical high school, a course of study in related chemistry, and an article on driver education.

Instructors of drafting are advised to read the thought-provoking article on "Descriptive Geometry for Industrial-Arts and Vocational-Trade Drawing."

There are 41 articles in this issue.

This Month's Cover

The cover this month shows another apprentice picture.

Mechanic Thomas F. Regan (left) helps apprentice Eldon M. Penfield form a mental picture of how to discover what needs to be repaired on the motor-generator that has been brought into the shop at the Fisher Lansing plant. Photograph, courtesy of Fisher Body Division, General Motors Corp., Detroit, Mich.

Coming Conventions

Feb. 23–25. **Ohio Industrial Arts Association,** at Columbus, Ohio. Headquarters, Deshler-Wallick Hotel. Secretary, Theodore Paige, Ohio University, Athens, Ohio.

Mar. 9–11. **North Carolina Vocational Association** group meeting at Raleigh, N. C.

Mar. 15–17. **Mississippi Guidance Association,** at Jackson, Miss. Secretary, Miss Eleanor Zeis, P.O. Box 771, Jackson, Miss.

Mar. 16–18. **American Society of Training Directors,** at Chicago, Ill. Headquarters, Palmer House.

Mar. 16–18. **New Jersey Vocational and Arts Association,** at Asbury Park, N. J. Headquarters, Berkeley Carteret Hotel. President, Dr. Albert E. Jochen, 180 Amboy Ave., Metuchen, N. J.

Mar. 23–24. **Alabama Vocational Association,** at Birmingham, Ala. Convention chairman, J. E. Fortin, director, Alabama School of Trades, Gadsden, Ala.

Mar. 24. **Tennessee Vocational Association,** at Knoxville, Tenn. Secretary, W. A. Seeley, 202 Memorial Bldg., Nashville 3, Tenn.

Mar. 24–25. **Connecticut Industrial Arts Association,** at New Britain, Conn. Headquarters, New Britain Teachers College. Convention chairman, Richard B. Smith, Bristol High School, Bristol, Conn.

Mar. 24–25. **California Industrial Education Association,** at San Francisco, Calif. Chairman, Harry M. Krytzen, Galileo High School, San Francisco, Calif.

Mar. 30–31. **Industrial Arts Division of the Alabama Education Association,** at Birmingham, Ala. President, S. A. Taylor, Sr., 5108 First Ave. N., Birmingham, Ala.

Mar. 30–April 1. **Illinois Vocational Association,** at Chicago, Ill. Headquarters, Congress Hotel. Convention chairman, Hobart H. Sommers, Board of Education, 228 N. LaSalle St., Chicago 1, Ill.

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VOL. 39, NO. 3 MARCH, 1950

Industrial Arts and Vocational Education

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

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-IAVE-
MARCH . . . 1950

Planning School Shops in Baltimore County, Maryland

ARTHUR A. DICK
Supervisor, Vocational Education and Industrial Arts
Towson, Md.

The past year marked the one hundredth anniversary of the founding of the school system of Baltimore County, Md. A school system that emerged from the humble beginning in 1849 to the present pupil enrollment of 36,000 pupils in day schools. The good old days contributed to a new era. From the old days and the new era a positive philosophy of education gradually developed — "No Backward Step Was Taken."

Through the progressive professional leadership of Edward G. Stapleton, superintendent of schools, and the wide-awake forward planning of the board of education of Baltimore County, we have been fortunate to be able to build and place in service several new schools in 1949, which in turn have added eleven new shop facilities to our existing industrial-education program. In this article are shown photographs and floor plans of representative shops in several of our new school buildings.

Among the questions that must be asked and answered in planning new industrial-education facilities are:

1. What are the needs of the pupils?
2. What are the needs of industry and the community?
3. Have surveys of various types been conducted to determine these needs?
4. What is the status of instructional materials and courses of study?
5. What are equipment needs?
6. Is the offering of industrial-arts and vocational subjects proportionate to the needs of living, business, and industry?
7. Will the new facilities be adequate as to scope of offering?

As a criteria in planning new shops we based our thinking on the following hypotheses and philosophies. Some of these basic considerations were arrived at through meetings with the following supervisors of industrial education and the writer: William C. Feddeman, Montgomery County, Md.; Frank Gunderloy, Anne Arundel County, Md.; and Elmer K. Zeller, Prince George's County, Md. Also, the construction engineer, shop teachers, principals, and others of Baltimore County were consulted from time to time.

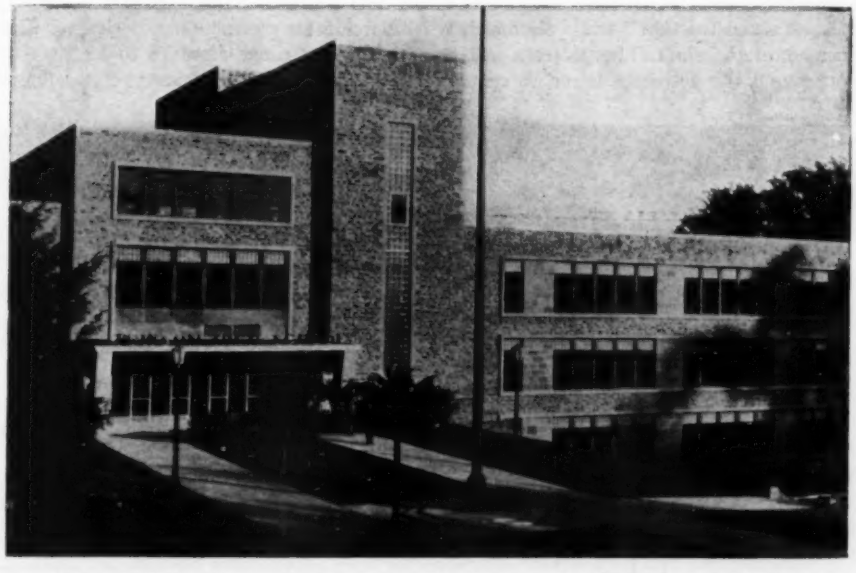
Basic Considerations in Planning School Shops

Introduction. Of necessity the cost is almost always the final consideration. School shops were considered from the practical and functional point of view, rather than from the so-called *idealistic* point of view. Information presented is not meant to be all-inclusive, but rather to provide guidance value in the construction of new shops.

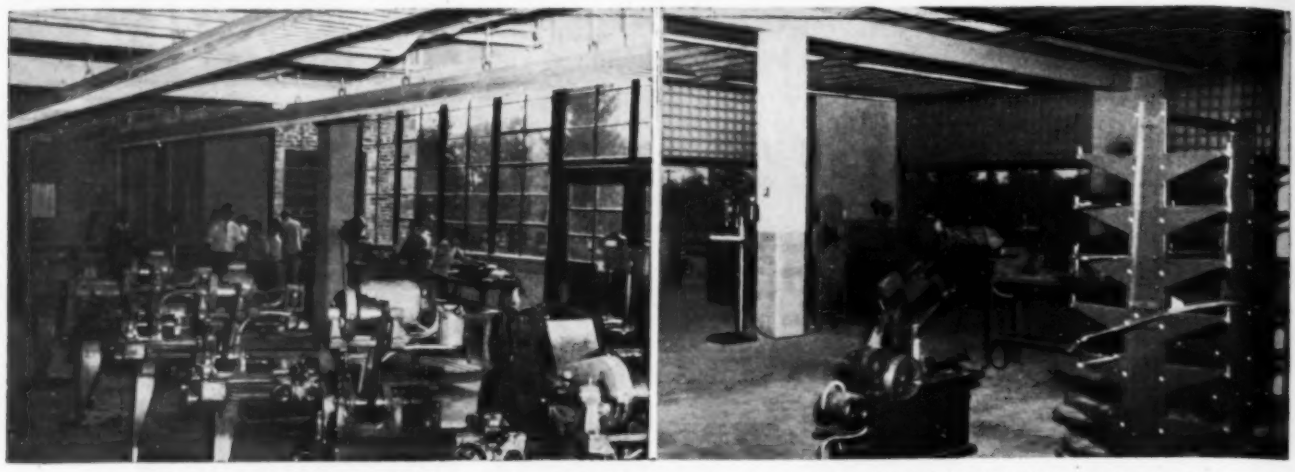
School shops should be planned to house a definite program which has been conceived or established prior to construction. It is recognized that the smaller school may have a comprehensive general shop which must serve both the junior and senior high school. In the larger schools a general shop can serve the objectives of the junior high school, and unit shops may better serve the needs of the senior high school. Where the size of the school justifies several shops, it might be well to consider a separate shop building.

Characteristics of School Shops

Junior High School Industrial-Arts Shops (Grades 7, 8, and 9). The principal



Towson High School, Baltimore County, Md., opened September 8, 1949



(Left) Machine shop, Senior High School, and (right) general shop, Junior High School, Baltimore County, Md.

objective of the junior high school industrial arts is to provide for exploratory and tryout courses; this program is a part of general education. There should be a wide range of planned activities, such as: drawing, woodwork, metalwork, plastics, ceramics, and electricity. Emphasis should be on hand tool operations. The portable types of machines and equipment are generally utilized. Tool panels are provided in the shop. Projects are usually small and varied. Class size, for effective teaching, may range from 25 to 30.

Senior High School (Grades 10, 11, and 12). At this level the general shop or unit shop can both serve the needs; the comprehensive general shop for the smaller schools and the unit shops for the larger schools. This shop may have more area than the junior high school shop. The machinery and equipment may be of heavier construction and permanently located in the shop. The projects will be larger and the activities fewer. A centralized toolroom may be utilized and pupils may have individual sets of tools. The class size tends to be smaller than for the junior high school shop, and the range may be from 20 to 25.

Vocational Shops (Grades 10, 11, and 12). In all shop classes we should plan for living and citizenship. These shops may be prevocational, vocational, or pre-employment. These shops should be well equipped with adequate floor space as shown by following examples:

Shop	*Sq. Ft. Floor Per Pupil*
Auto mechanics	150
Drafting	50
Bricklaying	120
Cabinetmaking	90
Machine trades	100
Printing	75
Sheet metal	60

In vocational shops provisions should be made for production experiences. Class size should range from 15 to 25.

Floor Area. The minimum dimensions of a corridor type of shop should be 30 by 56 ft.; 30 by 70 ft. is better. The minimum number of square feet per pupil should be 50. Depending on the type of industrial-arts shop, the number of square feet per pupil may range from fifty to eighty. A shop width of 23 ft. is not recommended, as it is too narrow.

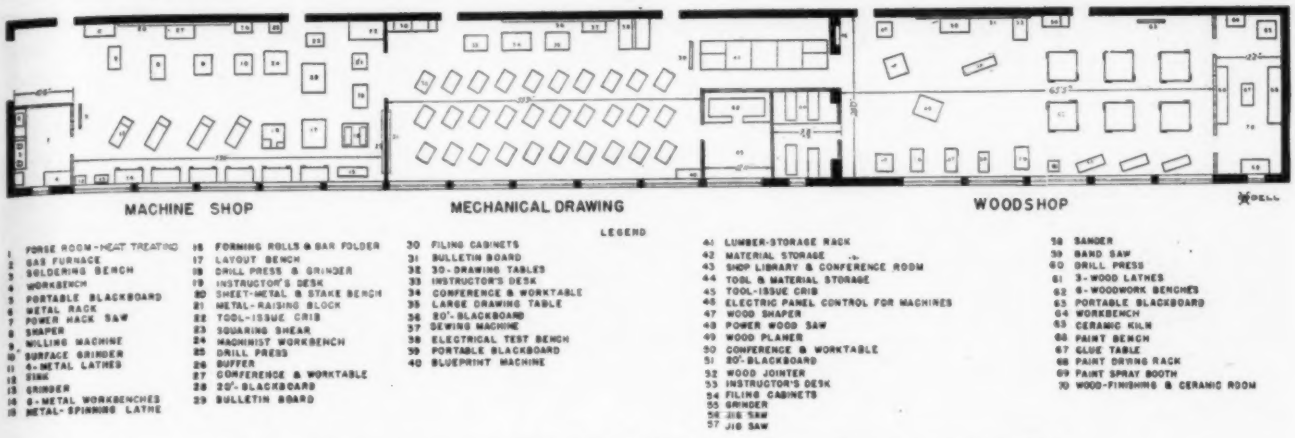
An end of wing shop can be dimensioned as follows: 56 by 42 ft., or 56 by 56 ft. The 56 ft. is made up of two 23-ft. widths and a 10-ft. corridor.

Minimum dimensions of typical industrial-arts shops, excluding facilities for finishing, toolroom, and storage:

Junior High School general shop	30 by 56 ft.
Unit woodshop	30 by 70 ft.
Unit drafting room	30 by 56 ft.
Unit print shop	30 by 70 ft.
Junior-Senior H. S. general shop	56 by 56 ft.
Shop proportions	1:1 to 2:1
Minimum ceiling height	12 to 14 ft.

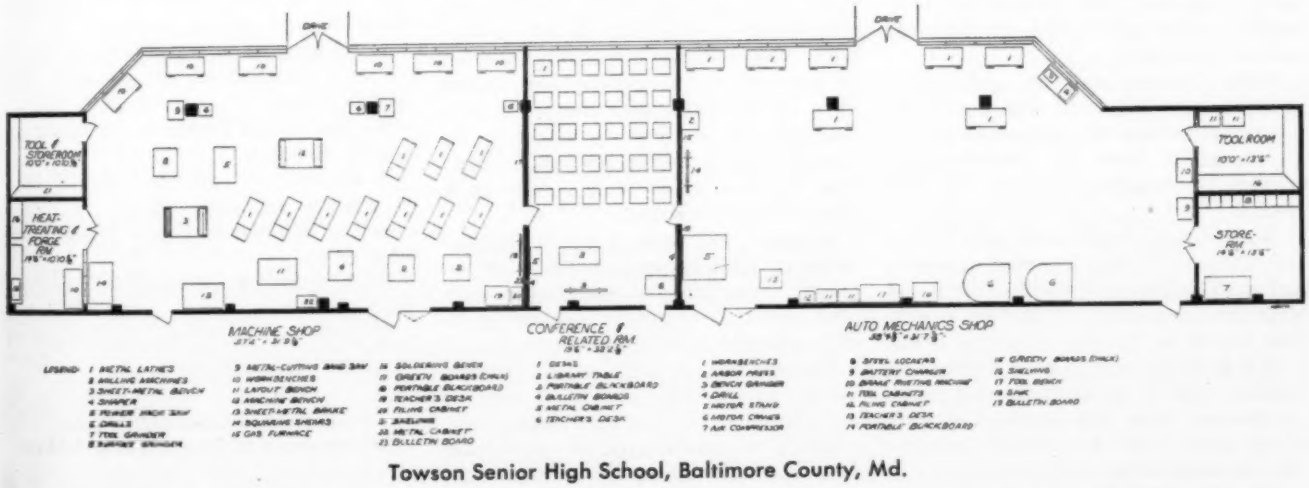
Lighting. Fluorescent lighting is recommended. The fixtures can be two tube type, 40w per tube; continuous rows are de-

(Left) General shop, Junior High School, and (right) unit drafting room, Senior High School, Baltimore County, Md.



Milford Millroad Junior-Senior High School, Baltimore County, Towson, Md.

Towson Senior High School, Baltimore County, Md.

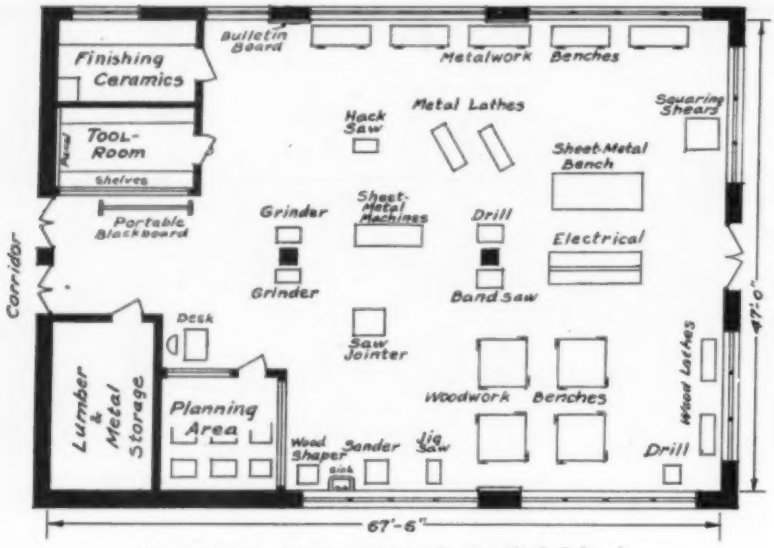


Towson Senior High School, Baltimore County, Md.

sirable in two banks controlled by two switches. If diffused lighting is desired the fixtures should have louvers and should distribute about 60 per cent of the light downward and 40 per cent to the ceiling for reflection. Fixtures should not have glass panels because of the danger of breakage. If concentrated light is required for close work on bench tops the direct industrial enamel reflector fixture, 2, 3, or 4 tube type, 40w per tube, can be used.

A blackboard light may be advantageous as well as spotlighting for machines and stations where 30 to 50 foot-candles are needed. Green glass chalk boards are used in several of the new shops in this county.

The foot-candles may range from 20 for nonprecision work to 50 for reading the micrometer. For present-day conditions 15 to 20 foot-candles should probably be the minimum for any part of the shop. For



General shop, Stemmers Run Junior High School, Baltimore County, Md.

drawing rooms 25 foot-candles minimum on the table top level are recommended.

Service Utilities. A generous number of base or wall receptacles should be provided around the perimeter of the shop.

Machines can be connected through floor receptacles joined to an underfloor distribution system; this makes the best looking job. If there is danger of moisture in the floor then overhead bus bars can be used. In this connection the overhead service (rigid conduit) should extend vertically from the machine at least 7 ft. before being suspended horizontally to the ceiling service outlet. Wall bus bars are used in some shops.

Master control switches and panels should be provided in the shop so that the instructor can turn off machines in case of an emergency. Three wire grounded connections are recommended even for 110v circuits.

Most shops should have gas, water, and compressed air. Drinking fountains and wash basins are essential. Toilets and washrooms should be conveniently located with respect to the shop or several shops.

It is good planning to have heating and lighting controls arranged so that shops can be used independently of other parts of the school building, especially for evening school purposes.

Floor Materials. The choice of floor materials is as follows: first choice — factory grade T & G hardwood; second choice — industrial asphalt tile on concrete base; plastic tile; battleship linoleum; third choice — concrete with hard finish.

Concrete, as a finished floor, is not recommended unless it is covered with asphalt or plastic tile; except for auto mechanics, machine shop, foundry, heat treatment, and welding, and it should be dust treated and colored when laid. Green, maroon, gray, white, etc., are acceptable colors. Most shop floors in our shops are concrete.

Window Area. Metal factory type sash appropriate to the school building architecture is serviceable. The minimum window area should be 20 per cent of the floor area. In many cases windows only on one side are feasible, but windows on two or three sides are preferred. The window sills should be above the bench heights. Some schools already have glass block for 50 per cent of the window area. Safety glass should get consideration. For auto mechanics the windows can extend to the floor, but guard rails are needed; the glass from the floor up to 42 in. — wire glass, glass brick, or cool ray.

Heating. The first choice is recessed radiators. Unit blower heaters are second choice. If unit blower heaters are used, they should be carefully selected as to efficiency and quietness of operation. If a concrete floor is used, as, for instance, in the auto-mechanics shop, it may be desirable that this floor have radiant heat.

Doors. A corridor type of shop should have two doors along the corridor wall; i.e., one single and one double door as shown in drawings. In most shops it is desirable to have double doors leading into the shop from the exterior. This can be provided in the wing, end, or separate shop building. These exterior doors should be about 8 by 8 ft.

Storage, Toolroom, Partitions. It is recommended that every shop be provided with adequate storage facilities at the time of construction. In general shop, partitions for activities — forge work, welding, heat treatment, are needed. These partitions should be transparent (glazed) above the 42-in. level. A finishing room should be in the plans for the woodshop. Definite storage areas should be planned for bar steel, sheet metal, and lumber. A toolroom is good practice for any shop using tools and machine accessories. The toolroom and storage rooms can have wire screen above the 42-in. level. In the storage room, shelves can be installed as follows: First shelf 32 in. from floor, next shelf spaced 16 in., and the remaining shelves spaced 12 in. Lockers and key panels should be considered at the time of planning.

Walls, Acoustics, Color. Five ft. wainscoting, easily cleaned, matt-glazed tile to avoid reflection.

On walls above wainscoting and ceilings, minimum absorption 35, 50 to 75 per cent preferred. The material should be easily maintained.

Ceilings to have flat finish — off-white, bone or ivory. Upper walls to have flat finish — light green, light cream, etc.

Example: Ceiling off-white; upper walls — window side and one end light rose-tan, inner wall and other end light blue-green.

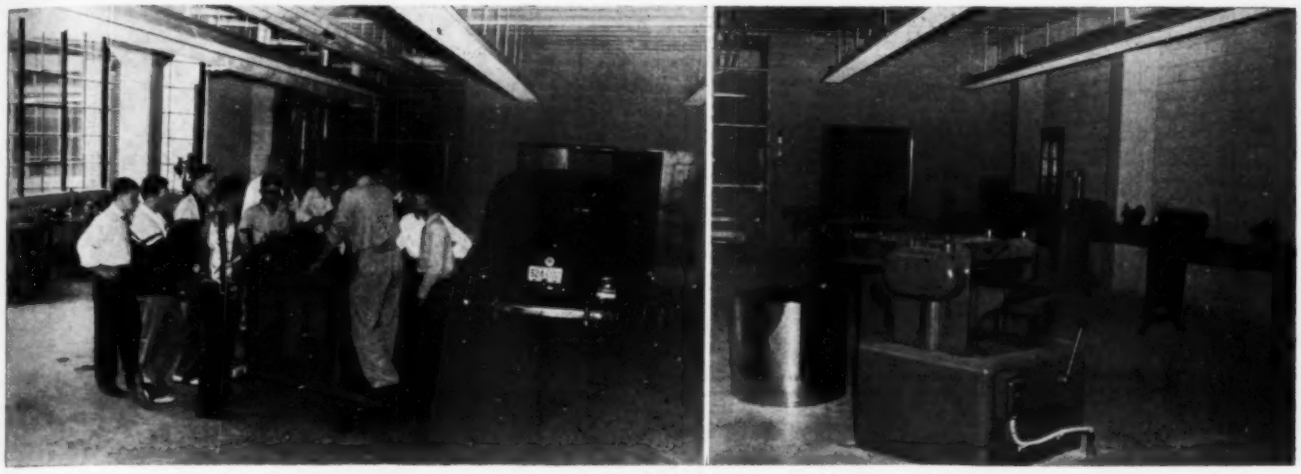
Dull finishes are desirable to avoid reflected glare; 60 to 85 per cent light reflectivity on walls; 85 per cent on ceiling.

Safety Factors:

1. Plan all areas visible from any part of the shop.
2. Utilize transparent partitions.
3. Use master control switches and panels in shop.
4. Plan enough floor area for maximum number of pupils.
5. Provide for adequate light; both natural and artificial.
6. See that the floor area is free from obstructions.
7. Adequate storage facilities will be a good investment.
8. Plan for organized arrangement of equipment and machines.

Factors to Consider in the Arrangement of Equipment in a Shop

The arrangement of equipment in a shop, such as machinery, benches, tables, chairs, and cabinets, is very important in good teaching, from the standpoint of efficiency, economy, safety, and appearance. In planning, be sure to have reasons for your actions, and consider all factors involved. *Planned procedures make for progress.*



(Left) Unit auto mechanics, and (right) unit woodshop, Senior High School, Baltimore County, Md.

A. Objectives
1. Efficiency — getting most out of situation
2. Economy of space— utilization
3. Appearance — appreciation

B. Factors to be considered
1. Physical
   a) Floor area
   b) Ceiling height
   c) Number and placement of windows
   d) Location — basement, first floor, etc.
   e) Lighting — artificial and natural
   f) Electrical outlets
2. Nature of school and shop
   a) Industrial arts or vocational
   b) General or unit type; junior high school or senior high school
   c) Size of classes
   d) Number of teaching activities
3. Equipment data to be considered
   a) Portable or fixed
   b) Amount and size of equipment
   c) Painting standing positions and areas
   d) Rubber mats
   e) Noise elimination
      1) Vibration
      2) Acoustics
      3) Foundations
4. Passing lanes and clearance — arrangement
   a) Lanes for efficiency of movements
   b) Clearance — especially for power saws and jointers — wood and machine lathes
5. Arrangement of workbenches and drawing tables, etc.
   a) Staggering
   b) Grouping
   c) Line
   d) Mixed
6. Safety — very important

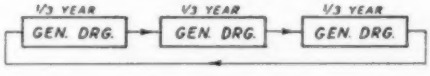
C. How to proceed
1. Draw shop plan to scale
   a) Study plan for advantages and disadvantages
   b) Compare with other plans
2. Move equipment around
   a) Check for results
   b) Have reason for change
   c) Use models and move positions
   d) Trial and error method
3. Counting movements
   a) Scientific approach
4. Study plans already in operation
   a) Actual shop situations
   b) Literature

Sample Organization for Junior High School Industrial Arts

Required — 3 periods per week

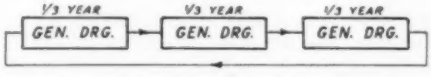
Grade 8

Rotate through 3 unit shops



Grade 9

Rotate through 3 unit shops

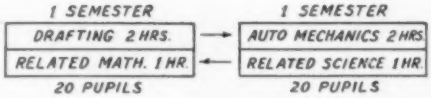


Sample Organization of Vocational Subjects and Industrial Arts for the Senior High School

Vocational

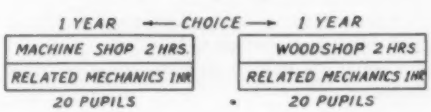
Grade 11

15 hours per week



Grade 12

15 hours per week



Industrial Arts

Elective 3 — 5 periods per week

Grade 10

First Semester
- Mechanical Drawing
- Machine Woodwork I
- Automotive Maintenance I
- Sheet Metals I

Second Semester
- Mechanical Drawing II
- Machine Woodwork I
- Automotive Maintenance I
- Art Metals I

Grade 11

First Semester
- Machine Drawing I
- Machine Woodwork II
- Automotive Maintenance II
- Machine Shop Occupations II

Second Semester
- Machine Drawing II
- Machine Woodwork II
- Automotive Maintenance II
- Machine Shop Occupations II

Grade 12

First Semester
- Architectural Drawing I
- Cabinet & Furniture Making III
- Auto Mechanics III
- Machine Shop III

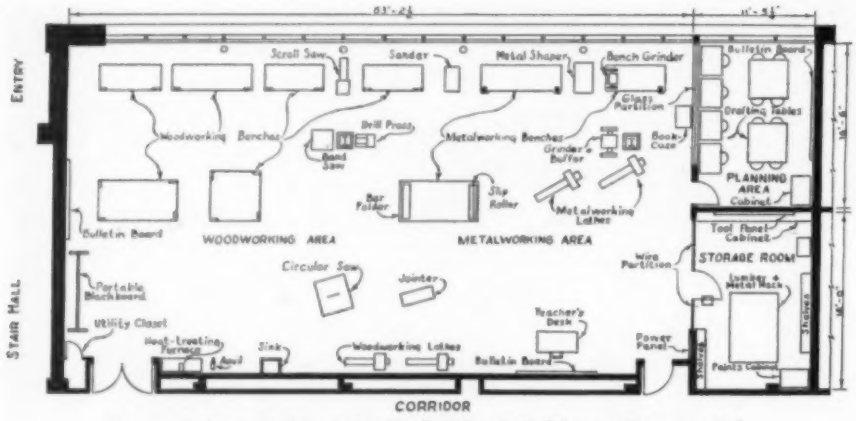
Second Semester
- Architectural Drawing II
- Cabinet & Furniture Making III
- Auto Mechanics III
- Machine Shop III

Brief Description of Courses in Vocational Shop

Shopwork in machine shop, woodwork, auto mechanics, sheet metal, drafting, etc., shall be given on a useful or productive basis.

Vocational programs can be set up for one, two, or three years.

Time: Not less than 15 hours per week



General shop, Sollers Point High School, Baltimore County, Md.

and not less than three consecutive hours per day shall be given to practical instruction. Related instruction in mathematics, science, and other subjects may be taught by the shop teacher as a part of his shop instruction in the shop or in an adjoining industrial laboratory.

Credit: 2½ units per year.

Vocational Auto Mechanics

Includes automobile servicing, motor analyzing, body repair, electrical system, wheel alignment, and trade mathematics, science, and drawing.

Vocational Woodwork

Consists of units in cabinetmaking and carpentry involving hand and machine operations; also includes related instruction in mathematics, science, drawing, occupational problems, and patternmaking.

Vocational Machine Shop

Instruction in the use of the lathe, milling machine, drill press, grinder, shaper, and planer; correlation with foundry and welding; related work in mathematics, mechanics, and metallurgy.

Vocational Sheet Metal

Fabrication of cylindrical fittings, conical forms, irregular transitions, and duct fittings; also, related mathematics, drawing, and science.

Vocational Drawing

This subject may be either a vocational subject as preparation for a drafstman, or a subject related to other vocational subjects.

Brief Description of Elective Semester Courses in Industrial Arts

Mechanical Drawing I

Fundamentals of sketching, lettering, orthographic projection, and pictorial drawings.

Credit: ½ unit, 5 periods per week plus project.

Mechanical Drawing II

A continuation of mechanical drawing I with inking, tracing, and reproduction added.

Credit: ½ unit, 5 periods per week plus project.

Sheet Metals I

Fundamentals of sheet-metal operations, layout, and pattern development through basic projects.

Credit: ½ unit, 5 periods per week plus project.

Art Metals I

Making projects of artistic design from copper, brass, and aluminum.

Credit: ½ unit, 5 periods per week plus project.

Machine Woodwork I

Use of hand tools and machines for making woodwork projects.

Credit: ½ unit, 5 periods per week plus project.

Machine Shop Occupations I

Fundamentals of filing, drilling, and hand operations; lathe and machine practice; wrought iron projects.

Credit: ½ unit, 5 periods per week plus project.

Automotive Maintenance I

Changing tires, washing and polishing, lubrication, operation of the gasoline engine, care of an automobile.

Credit: ½ unit, 5 periods per week plus project.

Machine Drawing I

Orthographic projection and pictorial drawings of machine parts.

Credit: ½ unit, 5 periods per week plus project.

Machine Drawing II

Working drawings of machines and parts with sections, tracings, and reproductions.

Credit: ½ unit, 5 periods per week plus project.

Machine Shop Occupations II

A continuation of machine shop occupations I with addition of shaper and milling machine operations; foundry work.

Credit: ½ unit, 5 periods per week plus project.

Machine Woodwork II

A continuation of machine woodwork I with more complex projects.

Credit: ½ unit, 5 periods per week plus project.

Lapidary

The cutting, polishing and mounting of semiprecious gems and stones.

Credit: ½ unit, 5 periods per week plus project.

Automotive Maintenance II

The study of working parts of the automobile, such as axles, transmissions, differentials, and engines.

Credit: ½ unit, 5 periods per week plus project.

Architectural Drawing I

Fundamentals of home construction such as: wall sections, frames, cornices, roofs, floors, and landscaping.

Credit: ½ unit, 5 periods per week plus project.

Architectural Drawing II

Home planning, floor plans, elevations, and perspectives.

Credit: ½ unit, 5 periods per week plus project.

Auto Mechanics III

Manipulative work on mechanical parts, body work, engine tuning, painting, and overhauling.

Credit: ½ unit, 5 periods per week plus project.

Machine Shop III

Heat treatment of metals, complete machine operations, making a wood lathe project.

Credit: ½ unit, 5 periods per week plus project.

Cabinet and Furniture Making III

Designing cabinets and furniture, study and construction of period furniture and cabinets, paint spraying and finishing.

Credit: ½ unit, 5 periods per week plus project.

The new shop facilities in Baltimore County have been planned from a practical point of view to take care of our immediate needs. Provision has been made for flexible offerings in industrial education subjects. Shop facilities and offerings shall not be stabilized, but shall be adjusted to suit the requirements of pupils at various levels and categories; these requirements shall be determined by continual survey and study in co-operation with the community, business and industry. Baltimore County looks ahead!

THE COURAGEOUS

"They on the heights are not the souls
Who never erred nor went astray,
Who trod unswerving toward their goals
Nay — those who stand, where first comes dawn,
Along a smooth, rose-bordered way.
Are those who *stumbled* — but went on."

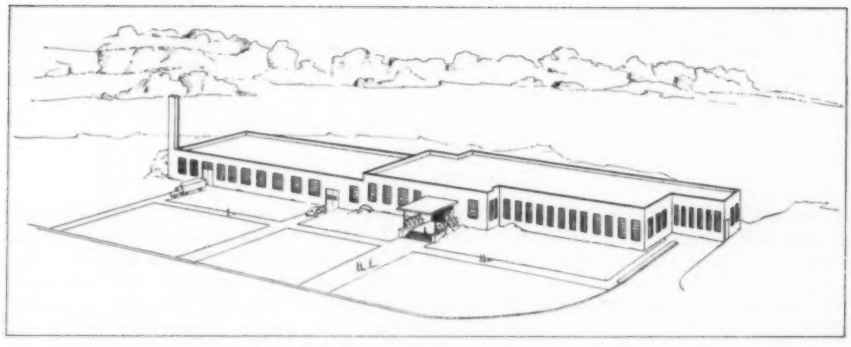
Be not disturbed at being misunderstood; be disturbed at misunderstanding. — *Chinese proverb.*

The Wausau School of Vocational and Adult Education

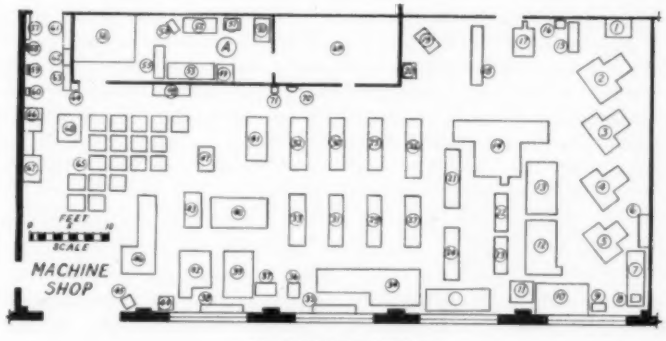
LAWRENCE B. HOYT

Assistant Director, Wausau Vocational School

Wausau, Wis.



Wausau School of Vocational and Adult Education



MACHINE SHOP

A. Storeroom

1. Electric furnace; 2, 3, 4, and 5. milling machines; 6. arbor cabinet; 7. babbitting bench; 8. gas furnace; 9. tool grinder; 10. workbench; 11. surface grinder; 12. internal grinder; 13. surface grinder; 14. 10-in. plain hydraulic grinder; 15. drill press; 16. drill press rack; 17 and 18. radial drill press; 19. hydraulic press; 20. tool grinder; 21. 16-in. lathe; 22 and 23. 11-in. lathes; 24. 13-in. lathe; 25. turret lathe; 26, 27, 28, 29, 30, 31, 32, and 33. 13-in. lathes; 34. 24-in. lathe; 35. heating convector; 36. drill press; 37. tool grinder; 38. bolt cabinet; 39. 16-in. shaper; 40. workbench; 41. two 9-in. lathes; 42. 16-in. shaper; 43. power saw; 44. filing machine; 45. arbor press; 46. 24 by 24 by 72-in. open side planer; 47. drawing table; 48. display table; 49. No. 1 milling machine; 50. cutter grinder; 51. workbench; 52. 10-in. shaper; 53. 13-in. lathe; 54. high-speed drill press; 55. power saw; 56. stock bin; 57. comparator; 58. Sheffield shadow gauge; 59. Rockwell hardness tester; 60. Sheffield shadow gauge; 61 and 62. tool cabinet; 63. locker; 64. bookcase; 65. chairs; 66. file cabinet; 67 and 68. desks; 69. tool crib; 70. wash basin; 71. drinking fountain

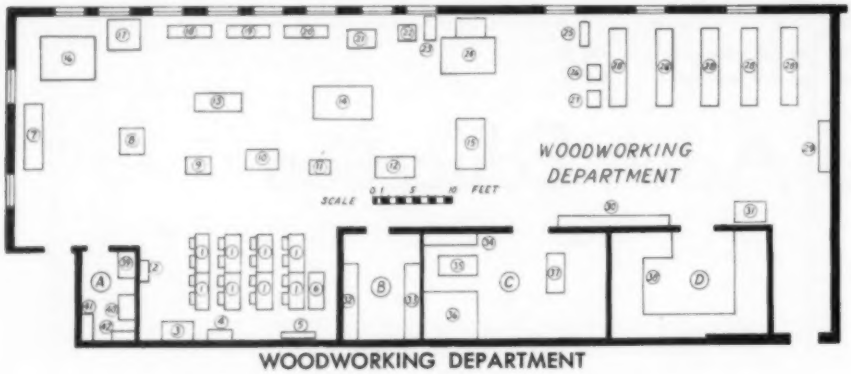
Technical and vocational education in Wausau has had a very rapid growth because of the increased facilities which came to this school through the city's purchase of a factory building. Many school boards have been hesitant about accepting a factory-type building for their vocational school program. The purchase of this factory building for Wausau's vocational education program resulted in a building well suited to that type of training and provided larger shop facilities than would have been secured if a new building had been erected.

This building has approximately 46,000 sq. ft. on one floor. After careful studying and planning, provisions were made for eight large shops, three classrooms, an agricultural division, a visual education room, a recreational area (with tentative plans for changing this over to rooms for the commercial division of the vocational school), and a room for the training of the physically handicapped from north central Wisconsin.

The trade and industrial division of the vocational school previously was housed in several locations throughout the city. The major classes were confined in the basement of the Central School building with grade school and junior high school all in one. As soon as the trade division of the school was brought under one roof, the percentage of adult students who attended these classes increased, showing that a separate unit for this type of program definitely has its advantages if it is to serve an adult group.

The curriculum has been designed to meet the industrial needs of the community. Through surveys, personal interviews, questionnaires, and the use of advisory committees, a program has been set up to serve the area. Our curriculum includes the necessary training so students can secure employment, and a program for those presently employed who are interested in trade extension.

Each trade uses advisory committees to recommend the course offerings. The advisory committees meet once a month to discuss the course content, the physical needs, and the trade extension program which should be offered in the community. The advisory committees are made up of



WOODWORKING DEPARTMENT

A. Office
B. Toolroom
C. Finishing room
D. Lumber storage

1. Study tables; 2. file cabinet; 3. drafting table; 4. magazine stand; 5. wall cabinets for books; 6. instructor's workbench; 7. portable sander table; 8. Delta saw; 9. shaper; 10. belt desk sander; 11. spindle sander; 12. DeVoe saw; 13. rip-saw and table; 14. jointer; 15. 36-in. band saw; 16. tenoner; 17. mortiser; 18, 19, and 20. wood lathe; 21. horizontal drill; 22. vertical drill; 23. jig saw; 24. surfacer; 25. jig saw; 26 and 27. miter-box saw; 28. workbenches; 29. clamp racks; 30. student lockers; 31. glue table; 32 and 33. storage cabinets; 34. supply case; 35. finishing table; 36. spray booth; 37. worktable; 38. lumber racks

employers and employees who become salesmen for the school. This group acts as a barometer to determine what courses should be offered for their respective trades in the community. One of the recently developed advisory committees deals with the course offerings for labor and management, the objective being to build better labor and management relations. Through the recommendation of the advisory committees, the school has recently added human relations to the curriculum believing that this phase of the training is as important as safety training.

All students are given entrance tests. These tests are not used to exclude students but to make an analysis of the students' needs and then a prescribed course is set up to fit these needs. All students are taught on an individual basis and allowed to advance as rapidly as their abilities permit.

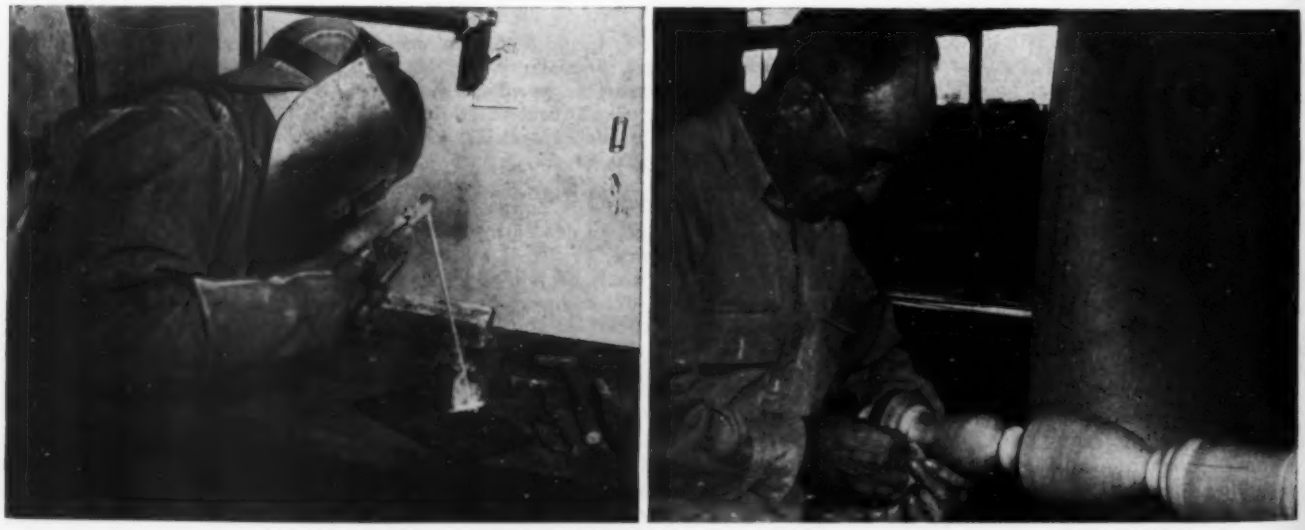
In addition to the testing program conducted for all students, the younger students electing to come to the vocational school enter the school under general continuation classifications. In this program, of one- or two-year duration, the students are required to take general courses in trades at the school to determine more definitely their interests and abilities. Along with these courses they are required to take social science, mathematics, English, general science, and reading.

All departments in the school have visual education equipment. This includes a projector and film strips which are available for each particular trade. The visual education room, which has been designed to hold approximately 180 people, is utilized once a week for assemblies and also assigned to the various shops for their visual program. No films or film strips are used by any shop instructor unless there is a definite connection between the film and the unit of instruction which is being taught. This eliminates the entertainment phase of our motion pictures which degenerates this tool of visual education.

Certificates of completion are issued to adult students who attend school for a single course. A card is issued to the student at the end of his training time and if at the end of three months of employment his employer certifies that the three months are successful, he then can secure his diploma.

The student body is governed by a student council with a president, vice-president, secretary-treasurer, and a board made up of one representative from each of the shops. The student council organizes and conducts all school parties, athletic events, special programs, arranges for speakers, and, in certain instances, handles disciplinary problems.

A follow-up program has been inaugurated whereby the school contacts the industry as soon as the student is placed, followed by other contacts in two or three



Welding, and woodturning in the cabinetmaking course

months. During these visitations the school can get firsthand information on the improvement of their courses.

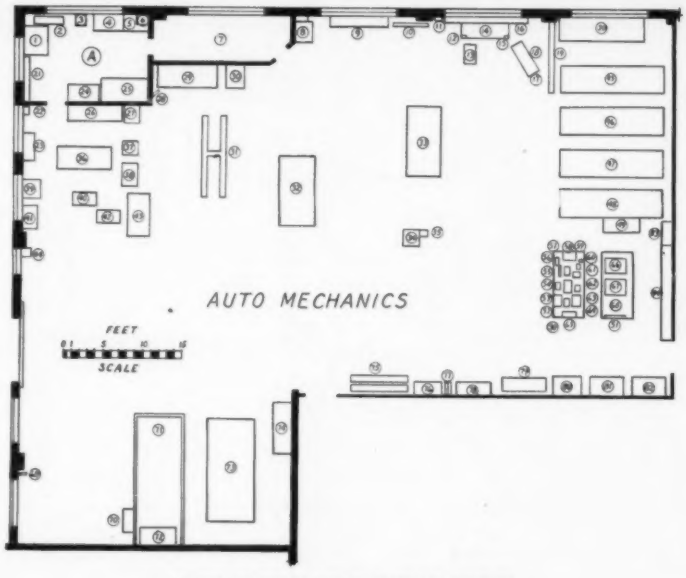
The auto-mechanics department is designed to handle approximately 18 students. The major courses offered in this department include auto body repair, chassis reconditioning and repair, power plant repair, electrical system and maintenance. The shop is designed so that there is an area for each one of these major divisions. Much stress is given to lubrication and washing of cars, feeling that a number of students, if properly trained, could go directly into filling stations. The special test laboratory is set up for the testing of carburetors, fuel pumps, distributors, and generators. Many commercial companies have asked the school to conduct the training for them within our city because of the facilities which we have for this type of program. In addition to trade preparatory work, the related instruction is given to auto-mechanic apprentices.

The machine-shop department has been designed to meet the needs of those that will be going into the machine-shop trade. The course is recognized by the unions. Two years' credit is given for the training received at the vocational school toward an apprenticeship. It is understood that it is impossible to give complete training in this particular department; however, it does give the background which is necessary for a competent machinist which, along with an apprenticeship training program, will develop a first class machinist.

All equipment in the shop is of the industrial type including grinders, milling machines, turret lathes, and large shapers. A study section is provided in the machine-shop room. A full-time toolroom man is employed to issue tools and stock and maintain the small tools. It has been found that it is much more economical in a shop of this size to maintain a full-time toolroom man than to use a student within the toolroom.

A section has been provided with special precision machines whereby industrial men can come in and use these machines to design parts and develop processes to aid in solving industrial problems. The department is used by industry to give practical manipulative tests to determine the classification of machinists at the time they are applying for a job.

A complete set of precision instruments is used for the measuring of all projects. The projects range from small shafts to completed drill presses and arbor saws. The department is designed to accommodate approximately 20 students. In addition to giving trade preparatory training for the machinists, related instruction is also conducted for the automotive repair students and related instruction for apprentices who are working in the trade.



AUTO MECHANICS DEPARTMENT

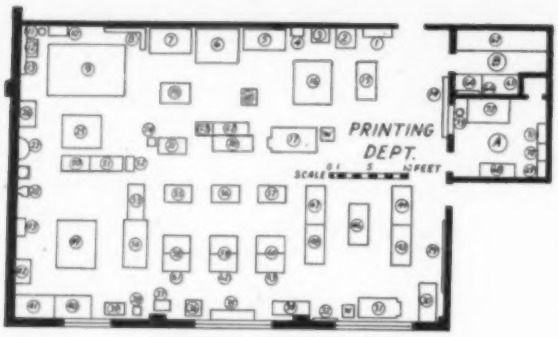
A. Electrical room

1. Fuel pump table; 2. battery charger; 3. battery tester; 4. carburetor; 5. generator table; 6. distributor table; 7. toolroom; 8. tool locker supply; 9. heater; 10. rear axle; 11. front wheel alignment equipment; 12. vise; 13. brake reliner and grinder; 14. relining adjuster; 15. vise; 16. equipment for working is hung on wall; 17. brake bleeder; 18. brake drum lathe; 19. bookcase; 20. table; 21. lockers; 22. brake riveter; 23. worktable; 24. distributor tester; 25. table generator and distributive parts; 26. worktable — connecting rod aligner, reboring bar, cutting press; 27. valve grinder; 28. hand grease gun; 29. air power grease gun; 30. drain mobile; 31. hydraulic hoist; 32, 33. worktable; 34. wash basin; 35. wastebasket; 36, 37, and 38. motor; 39. welder; 40. motor; 41. grinder; 42. motor; 43. cleaning pan; 44. spark tester and cleaner; 45, 46, 47, and 48. table; 49. desk; 50 and 51. table; 52 and 53. transmission; 54. ring gear; 55. universal joint; 56. ring gear; 57 and 58. transmission; 59. speedometer; 60. starter motor; 61, 62, and 63. transmission; 64. cluster gear; 65. transmission; 66 and 67. Ford motor; 68. thermostat lister; 69. faucet; 70. brooms; 71. tool shed and storeroom; 72. air compressor; 73. chassis model; 74. Hobart welder; 75. two packs; 76. sun motor tester; 77. creepers; 78. Porto power; 79. hoist; 80. Ford V-8 motor; 81. Cadillac motor; 82. Pontiac motor; 83. filing cabinets; 84. clothes rack

The general metals department is primarily for giving instruction to the general continuation students, that is, the younger students, to determine whether they are interested or have the aptitude and ability to carry on in the metal trades. After nine weeks in this department the instructor can determine if they should go on into the machine shop or other metal trades. Related welding instruction is also a part of the instruction in this department for plumbing and sheet-metal apprentices. Related welding is also given to students majoring in auto mechanics.

The welding division of the general metals department consists of 12 welders of various types, both a.c. and d.c. and gas welding. The course is short but intensive in this field. There is enough equipment to give instruction to 15 students at one time.

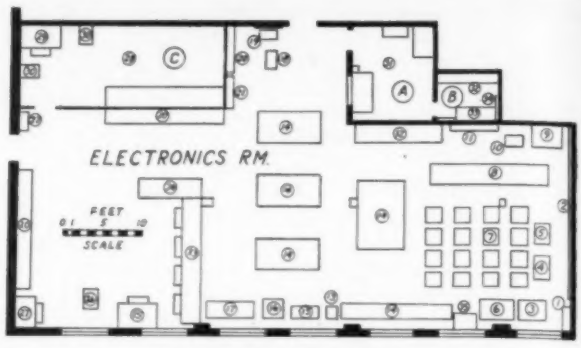
In addition to the usual equipment that is provided in a school woodworking shop, there is the equipment used in industrial woodworking shops. The student in this course is required to draw his project, make up bills of materials, lay out projects, and carry them through to completion. The department is provided with an ample study area, a completely equipped hand toolroom, a paint room, and a lumber storage room. The enrollment of this department is between 18 and 20 students. Our cabinetmaking course consists of selecting, grading stock, layout and matching stock, cutting to rough and finished sizes, and assembling, and finishing. Also the study of furniture design and period



PRINTING DEPARTMENT

A. Office
B. Storeroom

1. Mailing table; 2. perforator; 3. stitcher; 4. stapler; 5 and 6. coat hangers; 7. letter presses; 8. ink cabinet; 9. cylinder press; 10. drying rack; 11. paper roll; 12. drying table; 13. roller cabinet; 14. book shelf; 15. stock table; 16. paper cutter; 17. type cabinet; 18. ink cabinet; 19 composing store; 20. galley cabinet; 21. proof press; 22. table; 23. platen press; 24. refuse can; 25. automatic vertical press; 26. register table; 27. wash basin; 28. drinking fountain; 29. blackboard; 30. drafting board rack; 31. bindery table; 32. tool rack; 33. stick and line gauge rack; 34. mimeograph table; 35. radiator; 36. stamper; 37. mimeograph; 38. locker; 39. saw; 40. table; 41. table; 42. melting pot and caster; 43. file; 44, 45, 46, 47, and 48. study table; 49. linotype; 50. composing store; 51. boarder cabinet; 52. meter; 53. type dump; 54, 55, 56, 57, 58, 59, 60, 61, 62, and 63. type cabinet; 64. gathering table; 65. stock table; 66. gathering cabinet; 67. stock shelves; 68. typewriter table; 69, 70, and 71. files; 72. desk; 73. waste can



ELECTRONICS ROOM

A. Office
B. Storage room
C. Storeroom and office

1. Book shelves; 2. blackboard; 3. drafting table; 4. desk; 5. lecture stand; 6. radio service — book table (Rider Manuals); 7. classroom chairs; 8. code instruction table; 9. amateur radio station W9NEF (operating position); 10. transmitter; 11. equipment shelves; 12. test instrument cupboard; 13. drill press; 14. workbenches; 15. lathe; 16. grinder, drill press, coil — winder table; 17. 110-volt d.c. motor-generator set; 18. test transmitter; 19. gasoline generator; 20. student project lockers; 21. wire rack; 22. power distribution panel; 23. Navy electronic operating positions; 24. equipment table; 25. Navy control position; 26. BC 610 transmitter; 27. auxiliary control position; 28. Navy equipment storeroom and office; 29. Yeoman office desk; 30. filing cabinets; 31. instructor's office; 32. stockroom shelves; 33. workbench; 34. took racks; 35. heater

furniture. A combination of hand and power tools is used in this shop.

The course in radio repair is designed to give students a full knowledge of how to repair defective radios, to test circuits, tubes, and other parts, using various test instruments to discover the trouble, and then to fix or replace the defective parts. The students may also work toward becoming licensed radio engineers who can assume the full responsibility for the technical operation of a radio station in conformance with the regulations of the Federal Communications Commission. The department is designed to handle approximately 20 students. Two broadcasting stations are used for giving this training. The shop contains the latest equipment, and there also are test sets for television repair and installation.

The course in residential design is intended to prepare the student to completely design residential and small business structures and to become familiar with all types of building construction. In addition, the student is required to take business law, business administration, human relations, business letter writing, bookkeeping, and salesmanship. He is thus prepared for assistant managership in small lumber yards. The department is capable of handling 22 students at one time. Related blueprint reading is given to apprentice carpenters, machinists, and bricklayers.

The printing department is equipped to give instruction in elementary printing, hand composition, platen and cylinder presswork, bindery, and linotype. The department publishes the monthly bulletin and also does all the printing for the school. Approximately 20 students can be handled in this particular department. The objective of the course is to give basic training for those interested in going into the trade. This training supplemented by on-the-job training will make an all-round printer.

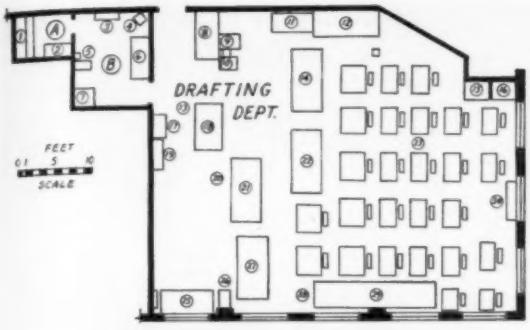
Related instruction in mathematics is required in all trades. For our general continuation group, mathematics, English, history, and general science are required. The general subjects laboratory is used for conducting scientific experiments in physics and chemistry as a part of all trade preparatory courses and related instruction for apprentices.

The vocational school has devoted a room to circuit instruction. This room is used each day by a different instructor who travels on an itinerary of four or five cities per week and gives related instruction to apprentices. The circuit program consists of six different instructors in six different trades. They include motor winding, house wiring, painting and decorating, plumbing, cosmetology, and salesmanship.

An unusual workshop for the severely physically handicapped has been set up by the local vocational school board in co-operation with the rehabilitation division of the state board.

A variety of tools and equipment is available for use by wheel-chair cases, partially paralyzed individuals and people with severe handicaps which normally confine them to their homes. Voluntary agencies transport these persons to and from the school. A specially trained instructor trains these disabled persons to make products through which they can have an income.

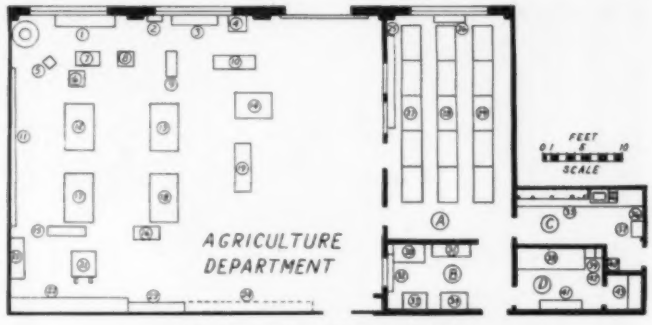
The vocational agriculture department consists of a shop, classroom, and testing laboratory. The curriculum deals with young farmers who have not attended high school or who attended high school but did not have vocational agriculture. The staff consists of three instructors and is the largest of its kind in the state. In



DRAFTING DEPARTMENT

A. Storeroom
B. Office

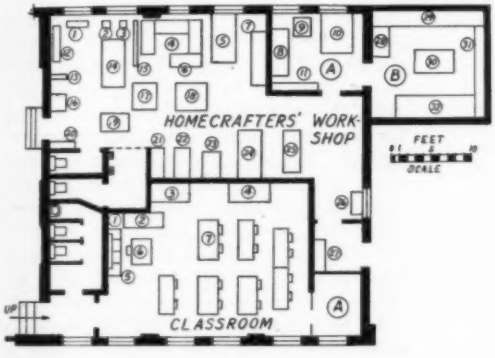
1 and 2. Equipment and paper storage; 3. bookcase; 4. typewriter stand; 5. filing cabinet; 6. instructor's desk; 7. table; 8. worktable; 9. paper rack and blueprint developing equipment; 10. sink; 11. blueprint machine; 12. worktable; 13. wastebasket; 14. perspective table; 15. reference shelf; 16. tables; 17. tool cabinet; 18. instructor's desk; 19. table; 20. wastebasket; 21 and 22. perspective tables; 23. drafting table; 24. heater; 25. worktable; 26. cabinet; 27. perspective table; 28. wastebasket; 29. worktable



AGRICULTURE DEPARTMENT

A. Classroom
B. Testing room
C. Supply room
D. Office

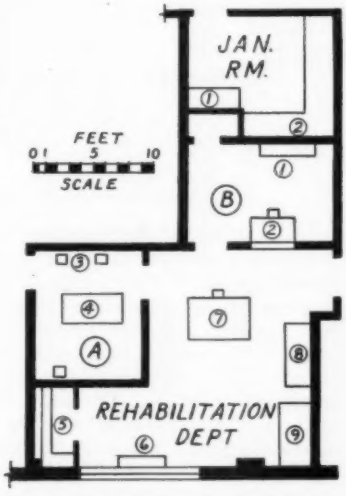
1 and 2. Workbenches; 3. register; 4. paint cabinet; 5. anvil; 6. meter box; 7. welder; 8. drill press; 9. jig saw and table; 10. wood lathe; 11. tool cabinets; 12, 13, 14, and 15. benches; 16. planer; 17, 18, and 19. benches; 20. lockers; 21. power saw; 22 and 23. lockers; 24. lumber pile; 25. book rack; 26. register; 27, 28, and 29. tables; 30 and 31. files; 32. bookcase; 33 and 34. desks; 35. storage cabinets; 36. milk tester; 37. gas stove; 38. desks; 39. files; 40. acid storage; 41. instructors' mail boxes and files; 42. desk; 43. office supplies and storage



HOMECRAFTERS' WORKSHOP

A. Office
B. Storage

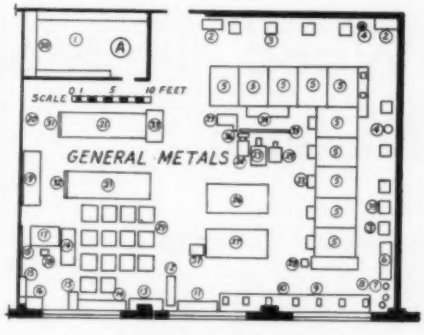
1. Saw; 2. drill; 3. saw; 4. tables; 5 and 6. tables; 7 and 8. cupboards; 9. chair; 10. desk; 11. bookshelf; 12. lathe; 13. saw; 14. table; 15. blackboard; 16. stove; 17 and 18. looms; 19. saw band; 20. table; 21. cupboard; 22, 23, and 24. tables; 25. showcase; 26. sewing machine; 27. table; 28 and 29. shelves; 30. table; 31 and 32. shelves



REHABILITATION DEPARTMENT

A. Private office
B. General office

1. Table; 2. desk; 3. chairs; 4. desk; 5. storage shelves; 6. radiator; 7. desk; 8. files; 9. table



GENERAL METALS

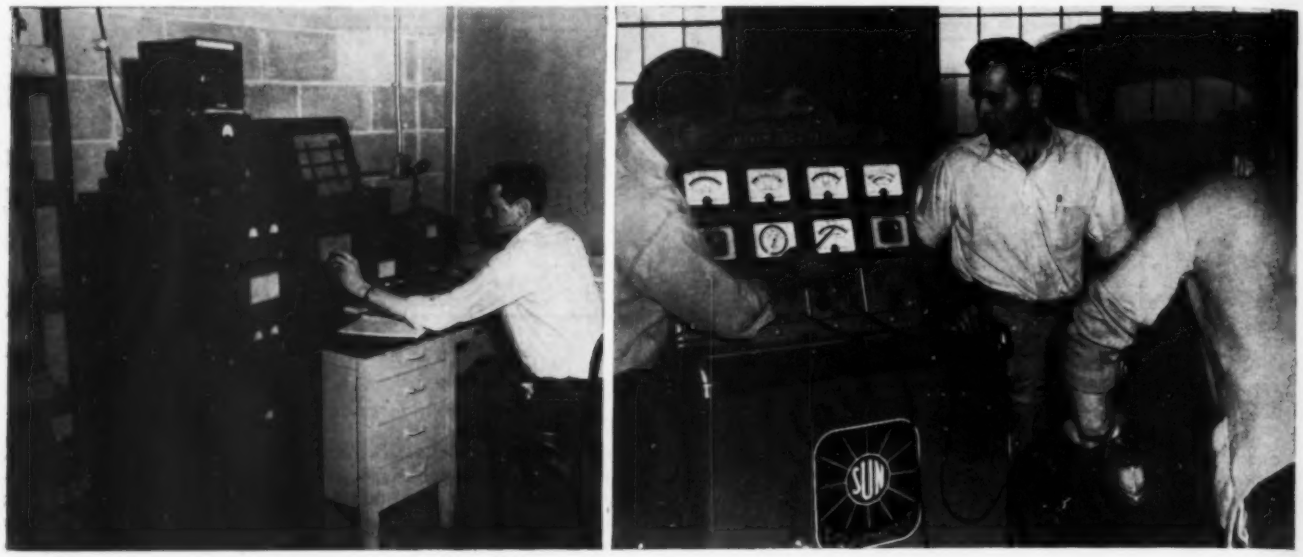
A. Tool crib

1. Tool crib; 2. electrode storage cabinets; 3. d.c. generators; 4. a.c. transformers; 5. welding booths; 6. storage cabinets; 7. Oxygen cylinders; 8. acetylene; 9. soldering furnaces; 10. soldering bench and storage; 11. register; 12. spot welder; 13. sink; 14. bookstand; 15. filing cabinet; 16. locker; 17. desk; 18. blackboard; 19. brake-box pan; 20. sheet-metal rotary machine; 21. layout benches; 22. oxyacetylene welding tables; 23. shapers; 24. two-wheeled pedestal grinder; 25. drill press; 26. stake bench; 27. vise bench; 28. angle iron cutter and bender; 29. side arm desk chairs; 30. metal rack; 31. bar solder; 32. slip-forming roller; 33. square shear, 36 in.; 34. stake rack; 35. wire-mesh guard; 36. dust collector for grinder; 37. exhausts for welding department; 38. desk chair; 39. storage space

addition to the above course, five special instructors are providing training for 120 veteran on-the-farm trainees.

The farm course is set up on the basis of one day a week attendance for part-time students. These young men are offered plant husbandry, animal husbandry, farm shop, and farm economics. The farm-shop program includes work in farm carpentry, soldering, rope work, sheet metal, farm welding, machinery repair, farm buildings, and concrete work.

In addition to the part-time work some young men attend school full time and take a complete rural course. This includes work in citizenship, rural sociology, and farm arithmetic, in addition to the courses offered to the part-time students.



Radio repair and broadcasting, and engine tune-up in auto mechanics, at the Wausau School of Vocational and Adult Education

Wood, the Modern Material

EDWARD E. HOOD
Henry Reis School
Evansville, Ind.

A few years ago, the great growth of the metal industry caused some persons to think that wood as a construction material was on its way out. This has not come to pass. Even with the many new uses for metals as supporting materials, the new aluminum siding, etc., most people still live in houses that are predominantly of wood. This is likely to be the case for a long time to come. Most persons prefer inside construction, trim, and furniture made of wood. Those who have home workshops almost universally choose wood as the medium with which to work. All this being the case, it seems unprofitable to speculate that wood and woodworking will be of diminished usefulness in the foreseeable future.

Even more convincing than this are statements of experts in the field that a large percentage of such items as a steering wheel, a telephone, or a fountain pen is wood. Plastics, even though they may be of the more recent materials, can hardly be called new any more. They are made from many basic materials such as coal tar, or the excrement of oriental insects. A constituent of about all of these plastics is wood. The old reliable, wood, is the filler that makes it possible to manufacture these synthetic resins more economically.

One of the earlier plastics was Bakelite, named after the inventor, Bakeland who brought it out in 1910. This group of plastics makes up three fourths of all those made in the United States and in all other countries where plastics are known. The chief ingredient is phenolformaldehyde, a derivative of coal tar. This material in dry powdered form becomes liquid when heated and along with its filler of wood flour is flowed into molds which give it the desired shape. Wood flour produced by grinding and screening is cheap and plentiful. Other materials such as cornstalks and soybean stems have been the bases of experiments, but they do not have the necessary strength to withstand stresses. Grinding them to powder destroys their fibers which gave them strength in their natural state. Some automobile companies retain the strength of the fibers by using them intact. This is done by felting together the fibers as it is done in the manufacture of paper, after which layers of the material are stacked, coated with a glue, and processed in a mold under pressure.

Unbelievably light and strong plastics were developed during the war to take the place of scarce metals, or other materials no longer available to us due to enemy encroachment upon former sources of supply. To give some idea of their strength, one called "papreg" will support 36,000 pounds per square inch as compared to 30,000 to 40,000 for mild steel. This material found usefulness as wing tips, fuselage, pontoons, etc., in airplane assemblies. Builders have a term, monocoque, which means self-supporting like an egg. This type of structure is possible with plastics which need no bracing, and can be formed in one piece. Other desirable characteristics of wood plastics are that moisture, heat, and vermin have no deleterious effect upon them.

All that has been done in the matter of wood plastics has been possible because of the substance, lignin, which constitutes 20 or more per cent of all wood. It is this substance that gives tall trees the ability to resist storms, and to support the great weights of snow that they do. Lignin cements together the fibers of the tree thus contributing to its resilience, and natural strength.

The Edison Company was one of the pioneer experimenters in this field. Owen Mason, an Edison assistant, found a way to unite wood fibers with natural lignin to produce the building material, Masonite. In Germany, waste fluids containing some of the components of lignin are made into soap. The artificial flavor, vanillin, which sells as high as $2.50 a pound, is a by-product. Another is a germ killer. Still another is an ingredient for fire extinguishers.

It is not at all beyond the range of possibility that the lignin of wood and forest may some day be the source of fuels to augment or supplant our dwindling supply of oils and gasoline. Thus wood, far from being outmoded as a modern material, is becoming one of the significant essentials of the future.

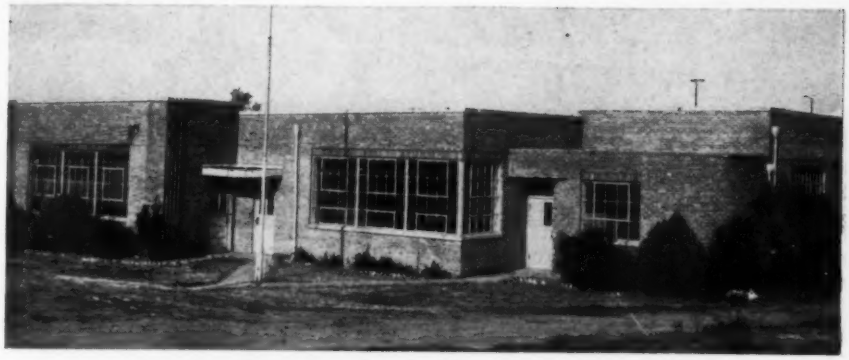
Industrial Education at the Arkansas A.&M. College

E. R. GLAZENER

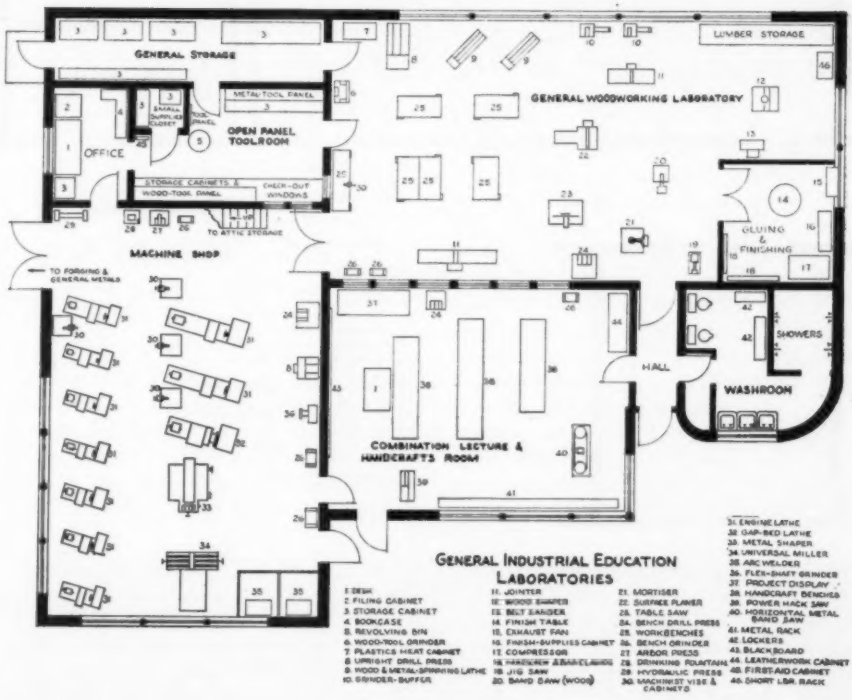
Head, Industrial Education Department

Arkansas Agricultural and Mechanical College

College Heights, Ark.



Industrial education building, Arkansas A. & M. College, College Heights, Ark.



The above mentioned college is unlike most land-grant educational institutions founded as a result of the Morrill Act. It is one of four created in 1909 in Arkansas by an act of the general assembly of the State Legislature. Through the forty years of its operation, this college has been known by several official names, but the present name of Arkansas A. & M. distinguishes it from the other three. In general, however, its purpose is the same as federal land-grant institutions — to serve the educational needs of the state and particularly the southeastern part of Arkansas in the agricultural and mechanic arts and related fields.

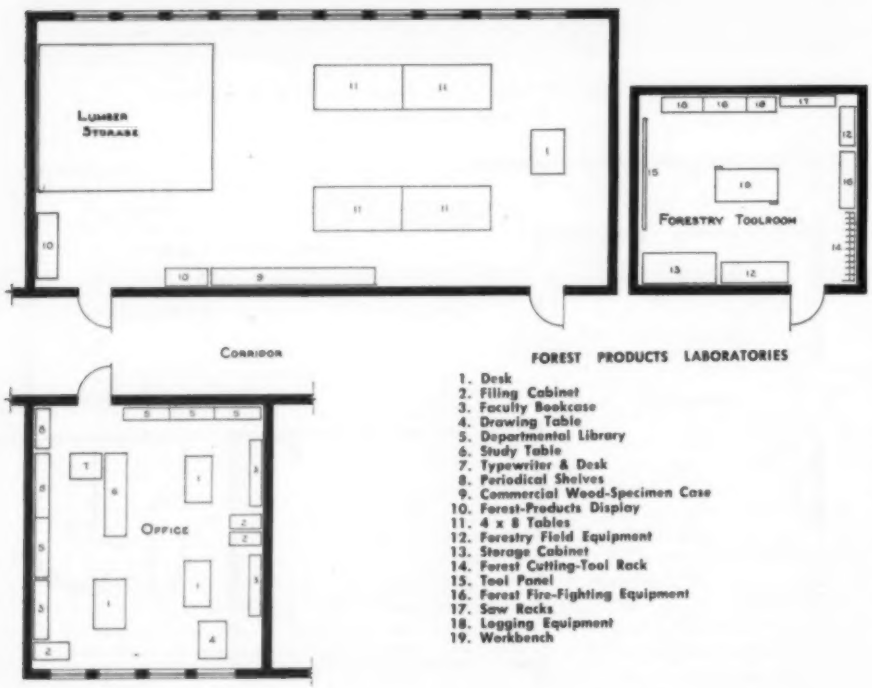
The department of industrial education is a separate department of the technical division, which also includes the departments of forestry, home economics, agriculture, and engineering. This department was created for the purpose of training industrial teachers, vocational workers, and other personnel for industry.

This college, as well as its industrial education department, was founded for the purpose of making standard college work available in an area of considerable size not within easy reach of other institutions. In comparison to states more thickly populated, this college boasts of efficiency rather than huge numbers in enrollment. It is proud to be located geographically in an area including vast tracts of pine and hardwood timber, oil fields and petroleum industries, cotton and textile industries, sawmills, furniture factories, and related forest industries, rich delta plantations, and prairie lands devoted to rice and cattle raising — truly an "Opportunity Land." Arkansas A. & M. is particularly proud to be located in an area whose short-leaf pine timber is considered the fastest growing in the United States and near industries producing over 94 per cent of the nation's bauxite or aluminum ore.

The curriculum in industrial education is planned to meet the needs of not only the industrial-arts teacher but also the needs of those students desiring a general knowledge of industry for employment in the industrial field. Graduates are adequately trained to teach industrial education from the secondary school level through the junior and senior college level, in such phases of work as drafting, woods, general metals, machine shop, handcrafts and others. As a result of the graduates' formal education in general industry, they have an opportunity to work in industry in the personnel, safety, sales, drafting, and supervisory departments.

Students are urged to elect professional

Drafting room at Arkansas A. & M. College



FOREST PRODUCTS LABORATORIES

1. Desk
2. Filing Cabinet
3. Faculty Bookcase
4. Drawing Table
5. Departmental Library
6. Study Table
7. Typewriter & Desk
8. Periodical Shelves
9. Commercial Wood-Specimen Case
10. Forest-Products Display
11. 4 x 8 Tables
12. Forestry Field Equipment
13. Storage Cabinet
14. Forest Cutting-Tool Rack
15. Tool Panel
16. Forest Fire-Fighting Equipment
17. Saw Racks
18. Logging Equipment
19. Workbench

forestry courses offered in the Department of Forestry, but directly pertaining to the woods courses in industrial education. Mathematics, physical and social sciences are encouraged, especially those dealing with the economic and labor problems in industry, thus giving the graduate entering industrial work a better understanding of problems they may encounter.

Approximately 9000 sq. ft. of floor area is available to students in industrial education for courses directly pertaining to their field of endeavor. Related and supporting courses are handled in other departments of the college. The accompanying photographs and laboratory or shop layouts show most of these facilities.

The industrial education building contains a combination office and departmental library, lecture room, machine shop, woodshop, and other areas as shown. The lecture room and wood shop serves also as an area for plastics, leather, metal, repoussé, and other handcrafts. For the present time, temporary quarters are provided for sheet metal, forging, gas welding, and related instruction. However, in all instruction, the most modern equipment is used in all phases of industrial education training.

This main general shop building contains approximately 3875 sq. ft. of floor area. Although it was converted from a prewar government, vocational training building to use exclusively for the department of industrial education, it is of modern architecture and adequately arranged for a general laboratory. The building is divided and the toolroom is centrally located so that two unrelated courses may be taught simultaneously without any interference. The interior color scheme follows the data developed in recent years and commonly called the "dynamic color scheme." This gives an attractive appearance, relief of eyestrain, and is generally conducive to better "housekeeping." The architectural design of these main laboratories gives ample natural lighting for the majority of the areas but is supplemented also by artificial means. Ventilation is provided by natural means as well as by exhaust fans.

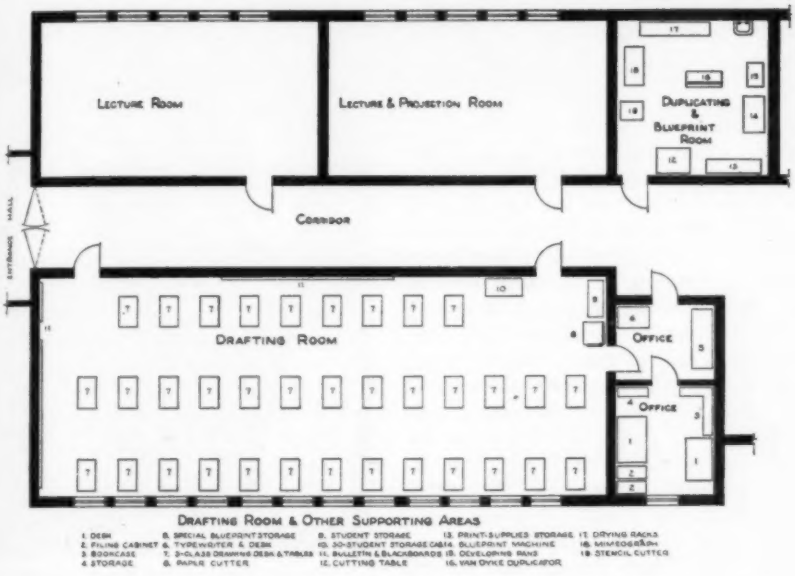
The woodshop contains approximately 1600 sq. ft. of floor area. Recently, a number of outdated machines were disposed of and replaced by modern machines, such as, jointers, drill presses, surfacer, table saw, band saw, mortiser, shaper, metal spinning and wood turning lathe, jig saw, grinder-buffers, and sanders, all of the latest design. Courses in this shop range from crafts and hand tool woodwork to carpentry and advanced cabinetmaking.

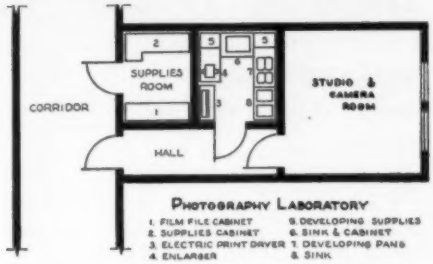
The machine shop is slightly smaller than the woodworking shop, and contains the most modern basic machines as well as several special or production machines. Such machines as the engine lathe, universal milling machine, bench grinder, flexshaft grinder, power hack saw, shaper, welder, gap-bed lathe, arbor press, hydraulic press, and drill press are all included. Additional space is anticipated whereby a satisfactory setup can be made for production machines, welders, forging, and related work. All work in these and other shops give basic and advanced principles of the particular course and are directed toward producing useful projects for the students or for others. Courses in this shop start with a course for beginners and end with advanced machine and general metalwork.

The drafting room and other supporting areas are in a near-by building and contain approximately 1625 sq. ft. of floor area. The best and most modern equipment is used here also, and the natural lighting is supplemented by an ample fluorescent lighting system. Besides the standard mechanical drawing equipment, the various types of lettering sets, universal drafting machines, duplicating machines and other aids are used. Such courses as beginning mechanical and machine drawing, advanced machine drawing, descrip-

Machine woodworking

Machine shop





tive geometry, architectural drawing, plain and ornamental lettering, and forestry topographic mapping are taught.

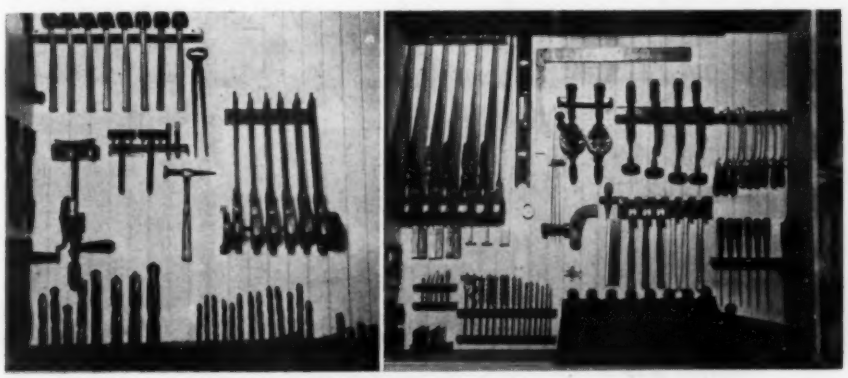
The photographic section is a recent addition and contains a floor area of approximately 250 sq. ft. Even though a beginner and in a small area, the new basic equipment is available for complete work from taking the picture through developing and reproduction.

The electricity area is of approximately the size as the drawing room. It is used in conjunction with and as a part of the physical science department. The other shops are used in the laboratory section of electricity as supporting instruction in motor hook-up and other types of related, practical electricity.

The forest products laboratory also contains approximately the same floor area as the drafting room. Lumber racks, storage cabinets, and other necessary equipment is available. Courses on lumber grading, forest products, wood identification, and forest protection are taught here. Several hundred acres of college-owned timber joins the main campus and makes outdoor laboratory work in these courses easily accessible. Huge tracts of industrial-owned timber, which is scientifically managed for selective cutting is within easy reach by a few minutes drive, for additional practical laboratory work.

A number of sawmills, furniture factories, cooperage mills, chemical and paper mills, weaving mills, aluminum fabricating plants, and others are located conveniently for field trips to industrial plants, many of which can be visited during one morning or afternoon period. This gives the student an opportunity to observe industry at firsthand, and thus study fields they may later wish to enter.

Many of these industries, as well as other fields, furnish the school with speakers on educational subjects. The speakers are usually invited by the industrial edu-



Tool panels at Arkansas A. & M. College

cation club, sponsored by the department and supervised by a faculty sponsor. This club is made up of those majoring in industrial education. They elect their own student officers and generally promote and arrange all programs and functions pertaining thereto, with the guidance and advisement of the sponsor. This student organization is definitely encouraged, since it tends to help develop the student's personality, organizational, social, and leadership abilities.

Many of these students secure student labor during the school term, and jobs in industry and other work during the summer months to help meet expenses of the school year. The cost is relatively small in comparison to many colleges, resulting mainly from the geographical location of the college and its supporting areas.

By the time a student receives his B.S. degree in industrial education, he should have a well-rounded general education as well as a definite professional background in general industry and industrial education. This is promoted by encouraging them to take elective courses in departments such as mathematics, business, fine arts, psychology, history, and additional English.

For those who choose a teaching career, apprentice or practice teaching is easily available in a public school adjoining the main campus. Students in this course have a considerable amount of guidance and supervision while they are teaching and conducting classes.

It is hoped that further expansion may be made in the near future toward a larger and more efficient industrial education department as a part of the Arkansas Agricultural and Mechanical College.

Seattle Modernizes High School Shops

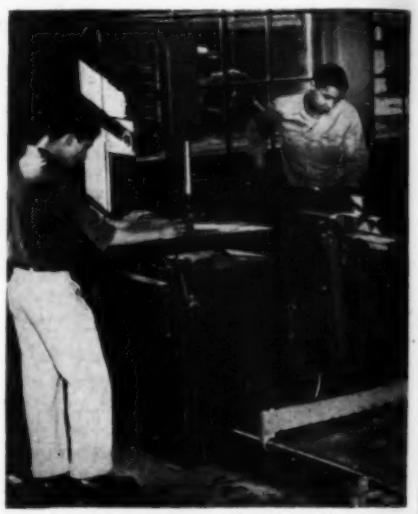
WILLARD BERGH
Director of Public Relations
Public Schools
Seattle, Wash.

Industrial-arts shops in Seattle, Wash., have had an overhauling which was much needed. Modernization of the shops includes enlarging the working areas, purchasing and installing youth-size power machinery and the standardization of tools in all shops of the eight high schools. In addition, a highly important in-service teacher training program has been set up.

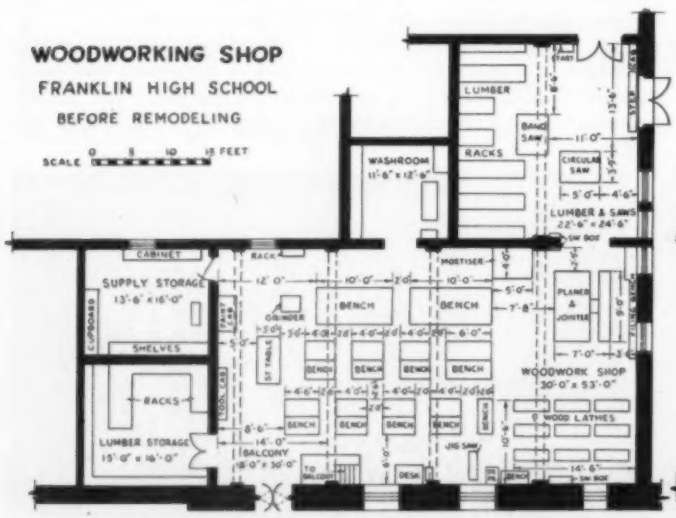
Typical of most city school shops, those in Seattle contained a conglomeration of overhead belt-driven power machines. Shop space, too, has been inadequate for the steadily increasing class enrollments of recent years.

Last spring Superintendent Samuel E. Fleming brought plans for modernizing the shops to the attention of the school board. The plans had been formulated following receipt of several reports from the industrial-arts committee of shop instructors, headed by Director E. Y. Greer and his aide, Dave Burrell. The reports drawn up by the instructors' committee were very thorough. They contained lists of every shop's power equipment with the date of installation, lists of all other tools, scale drawings of all shops, and complete records of enrollment which showed that the shops, originally designed for from 14 to 20 students, had been for many years housing from 25 to 35 students.

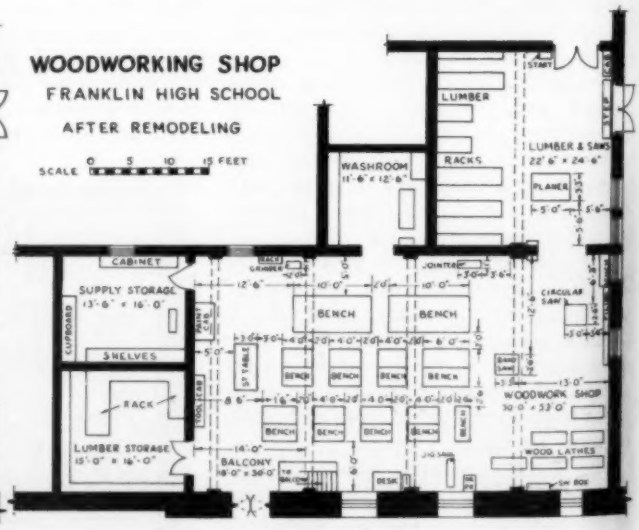
The school board listened and decided to modernize the shops as rapidly as pos-



Youth-size power tools replace outmoded heavy machinery



Before remodeling woodworking shop at Franklin High School



After remodeling and installing smaller machines

The old shop with belt-driven power tools

sible, and at a rate of at least one a year.

One of the committee reports showed that machinery used in 1948 was for the most part obsolete, not having been designed for school use in the first place. Nearly two thirds of all machinery was from 27 to 43 years old. This, of course, meant that spare parts weren't available and that therefore repairs were very costly. It was getting to the point where some repairs would cost almost as much as a replacement machine.

The modernization program called for the following machines to be installed in each high school metal shop:

Eight 13-in. by 4-ft. metal lathes
One 15-in. by 6-ft. metal lathe
One 20-in. vertical drill press
One 12-in. shaper
One 14-in. bench drill
One 4½ by 4½-in. hack saw with 14-in. blade
One 1 by 10-in. double head tool grinder

Each wood shop was to have the following:

One 10-in. table saw
One 20-in. band saw
One 6 or 8-in. jointer
One 24-in. surfacer
One 12-in. by 6-ft. wood lathe
One 1 by 10-in. double head tool grinder
One 14-in. bench drill with mortiser attachment
Six 12-in. by 4-ft. wood lathes

Tools were purchased from the low bidders and the new machines were then installed.

The superintendent's recommendation to the school board pointed out that the recommended list of power tools for each shop would create work stations for one half of the class enrollment and would provide maximum opportunity for full use of all machine tools.

All of the new machines are lightweight training type — "youth size" machines — and they are replacing adult size power tools, most of which had been run by overhead belts driven by 10-h.p. motors. It was pointed out that the smaller machines are much safer for boys and that the individual drive means economy of space.

The board okayed a gasoline engine shop for Garfield High School. This shop contains two 14-in. bench drills, one 9-in. lathe with collets, and one ¾-in. double grinder. Other schools will get gasoline engine shops at a later date.

The Garfield shops are being used for the in-service training program. During the first semester of this school year a group of 22 industrial-arts teachers took an evening course in metal shop methods. Another group of 17 recently completed a teachers' course in shop safety.

The newest course, which runs from February to June, on a weekly schedule of classes from 6 to 8 p.m., is one for architecture instructors and is highly successful. It was planned by Ernest Osgood, instructor at Lincoln High School. Osgood, a licensed architect himself, received the full co-operation of the Seattle Chapter of the American Institute of Architects which furnishes a professional architect for each class session.

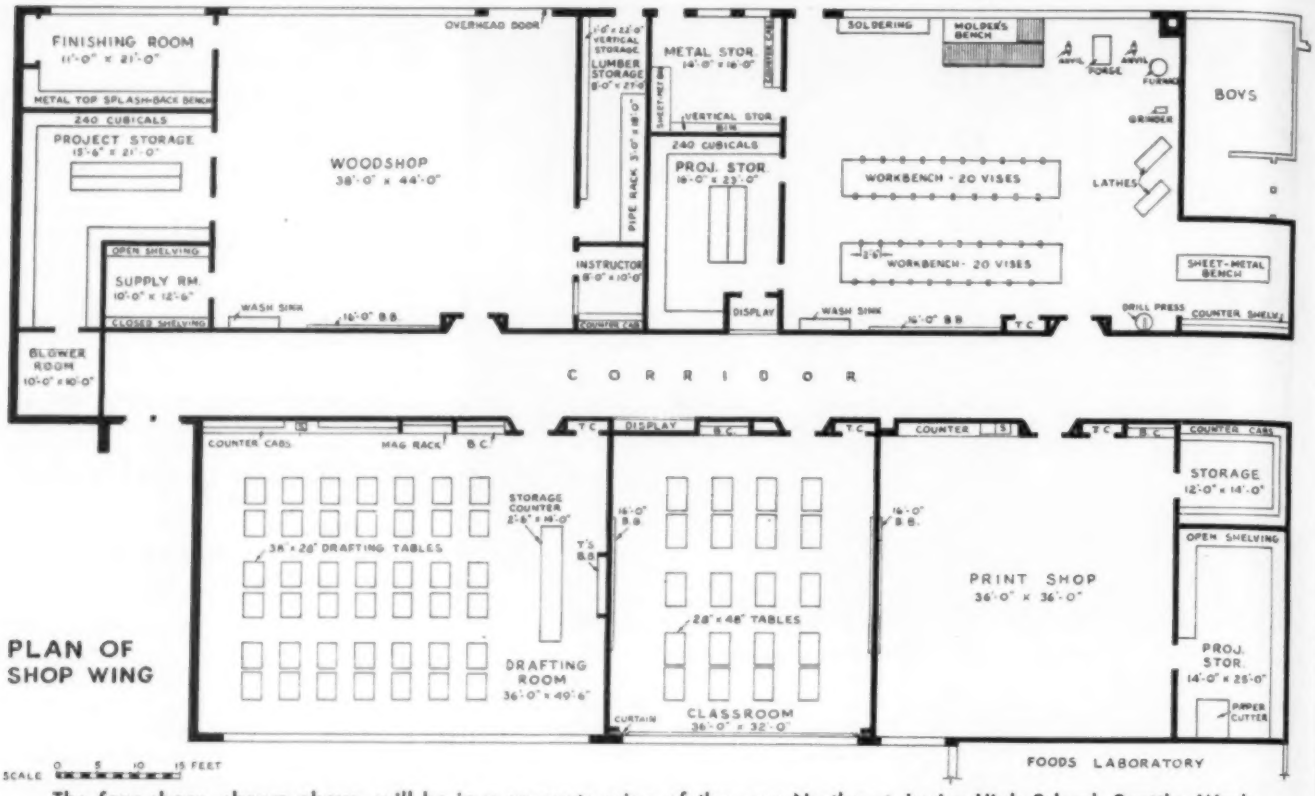
The modernized Garfield High shops now contain the following power tools:

Eight 13-in. engine lathes
One 15-in. by 6-ft. engine lathe
One 24-in. shaper
One contour saw
One drill press
One 6½ by 6½-in. hack saw
One 10-in. double tool grinder

In the modernized Garfield woodshop a 20-in. Delta band saw has replaced a 30-in. saw, a 10-in. unisaw replaces a 14-in. table saw, and a 6-in. jointer replaces a 12-in. jointer.

The 20-year-old Garfield power tools

(Left) Battery of 8 LeBlond regal engine lathes (13-inch) at Garfield High School, Seattle, which replaced 13-inch belt-driven engine lathes. (Right) Newly installed cabinet lathes



PLAN OF SHOP WING

The four shops, shown above, will be in a separate wing of the new Northeast Junior High School, Seattle, Wash.

which have been replaced were so much better than some of the 30- and 40-year-old tools at other schools that, for a while at least, other schools are using the old Garfield machines. As fast as possible, the old tools are being replaced and sold to highest bidders. In some cases U. S. Government surplus power tools have been obtained and installed as replacements.

One of the problems to be reckoned with in a modernization program is that of changing from two-phase to three-phase current. These changes are costing about $4,000 in Seattle since five of the eight schools have to make this change.

The "light" shops are to get a going-over later. Seattle recommends a minimum allowance of 40 sq. ft. per pupil and at least 960 sq. ft. of open shop area in "light" shops, with 50 sq. ft. and 1200 sq. ft. as adequate. For "heavy" shops the minimum would be 75 sq. ft. per pupil and 1800 sq. ft. of open shop, with allowances of 100 and 2400 considered adequate. Garfield's enlarged shops measure 33 by 68 ft. in the open shop, a total of 2044 sq. ft.

Drawing boards in the "light" shops are to be replaced. Many of them are from 25 to 40 years old.

When the modernization program is completed Seattle administrators and shop instructors can operate with a standardized program. In the past there has been a program for each shop because of its peculiar circumstances. The remodeled shops mean more space per pupil and better tools. The daily enrollment in Seattle shops has been about 7320 pupil hours and in recent years there's always been a waiting list.

Leo E. Whitney, left, a journeyman in welder repair at the Fisher Body Plant No. 1, Flint, Mich., instructs two new apprentices in the repair of a timer for a welder. The apprentices are Donald J. Wheeler and Walter J. Strudgeon

The Tacoma Vocational-Technical School

KARL B. KLUGE
Supervisor, Trade and Industrial Education
Public Schools
Tacoma, Wash.

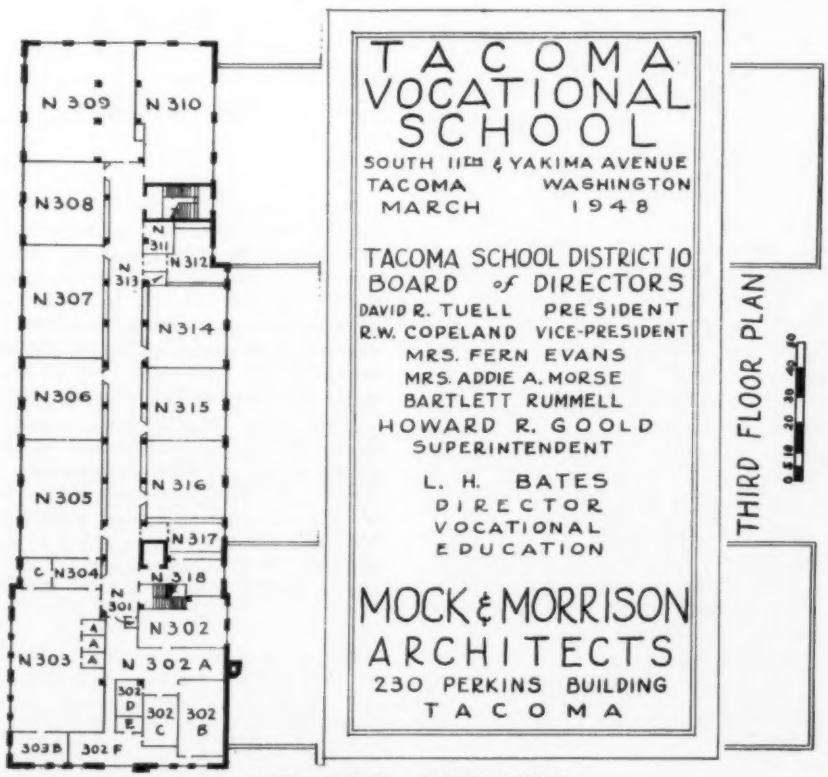
The Tacoma Vocational-Technical School represents an investment of $1,200,000 and will be furnished, upon completion, with $500,000 worth of furniture and equipment. Due to the contour of the site, which is on a rather steep hillside, the school forms a U shape about a paved court on the first floor, an L shape facing on the upper street on the second floor, and a straight wing on the third floor. The street location is approximately six blocks from the main business center of Tacoma. The school is serviced by two bus routes which make connections with all other routes servicing the city and surrounding communities. The traffic flow is quite heavy around the building due to the fact that we are located across the street from the United States Armory and the County Courthouse, one block from the public library, and have a business shopping district three blocks above us on the crest of the hill.

Fire protection is afforded from outside the building by two fire companies within a ten-block radius. Fire protection within the building is of several types, consisting principally of CO_2 and chemical portable fire extinguishing equipment, hose lines directly connected to the city water supplies, a completely automatic sprinkler system in the woodshops and also fire hose connections within the building that have external pumper connections. The main foyer and stairways are terrazzo, and except for molding, all materials are of the fireproof or fire resistant type.

The school is equipped with a visual aids auditorium that doubles for community programs directly related to the school activities, such as public meetings of state apprenticeship councils, local vocational education promotional committees, or programs relative to the craft training.

The building is laid out so that the three woodshops are grouped together; the metal trades, including automotive, are grouped together, along with the electrical and sheet-metal trades on the ground floor. This arrangement provides access to the shops individually by truck for the delivery of heavy supplies and equipment. The service trades are located on the second floor, which has the main entrances on the Yakima Avenue street level, allowing the public the shortest possible route to these shops. The radio broadcasting studio, distributive trades and business education are located on the third and top floors, where their related activities allow them to function as a unit.

The layouts of these shops reflect the best thinking available at the time of planning in vocational experience throughout the country. Material was accumulated from a great many sources, and Mr. Bates received permission from the school board to advise the architects as to the needs in terms of space and equipment arrangement. In each craft, a committee of three members from labor and three from manage-



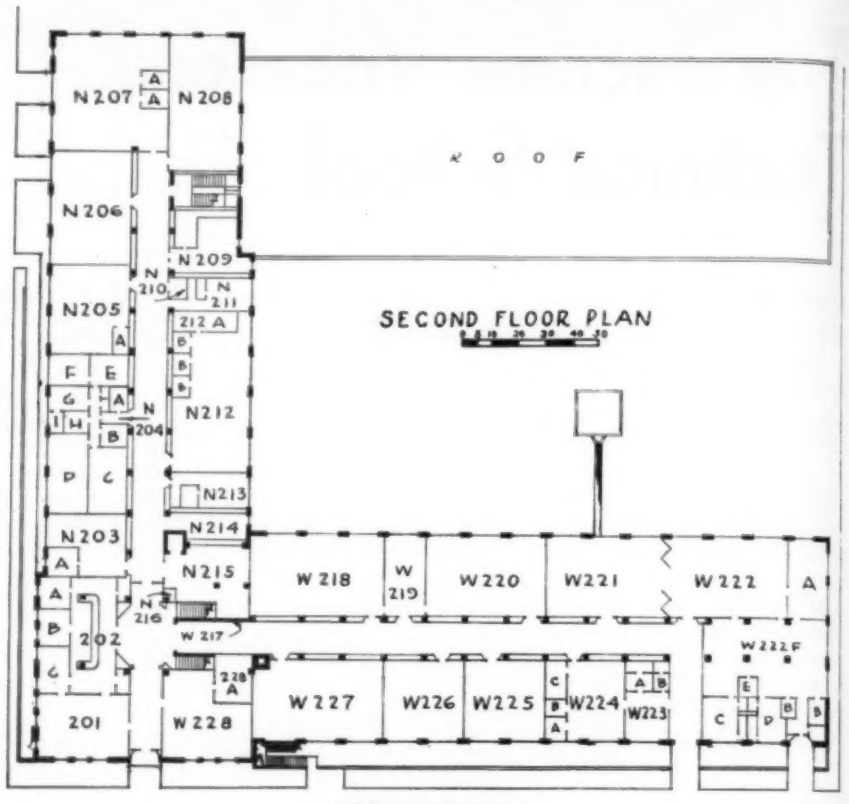
THIRD FLOOR — NORTH WING

N-301. Phone booth; N-302. radio production; N-302A. visual audience area; N-302B. studio "A"; N-302C. control room; N-302D. studio "B"; N-302E. instruction; N-302F. shop area and panels; N-303. office practice; N-303A. dictation booths; N-303B. mimeograph room; N-303C. storage; N-304. distributive education storage; N-305. distributive education; N-306. classroom; N-307. typing; N-308. typing; N-309. office machines; N-310. bookkeeping; N-311. storage; N-312. women's restroom; N-313. janitor; N-314. transcription; N-315. stenography; N-316. classroom; N-317. men's restroom; N-318. storage and freight elevator

ment were brought together at regular meetings with school personnel for the purpose of sifting the information received and to make recommendations in the light of community experience and requirements. These committees made concrete recommendations as to the size, type, and quality of machines required in each shop and approved tentative arrangement layouts prepared by students and instructors engaged in the program at that time. These layouts were then turned over to the architects and the building was designed and constructed in accordance with the recommendations. Each shop was laid out to provide the best compromise between the industrial standards existing in the Tacoma area and the best information relative to teaching techniques available.

The Tacoma Vocational-Technical School is a reinforced concrete structure faced with brick veneer and plastered throughout the interior, including semimovable partitions constructed of tile. The floors in the heavy shops are concrete and those on the second and third floors, as well as the hallways on the first floor, are covered with asphalt tile in patterned color arrangement. The shop ceilings are insulated with 1¼-in. Cemex and acoustic tile is used in those areas where sound control is important. The lighting throughout the building is of the two-bar fluorescent type with egg-crate diffusers attached. The general specifications comply with the requirements in Tacoma for industrial building construction. The ceilings and upper wall panels are painted in a light pastel green and the lower paneling in a darker or apple green shade. The service within the shops includes gas, electricity, compressed air, and hot and cold running water with individual drainage facilities in each for cleaning. The second and third floors make use of the same services wherever necessary for the type of trade being carried on, including steam equipment in the commerical dressmaking, and time clocks throughout the building.

The time clock system is set up with the intention of processing the cards through the business training office as a practical training project for those students. The classes are controlled by dial tone, and the fire alarm also operates by a siren type of tone signal throughout the intercom system. The intercom system is a two-way communication unit allowing calls to be made from control boards on the first and third floor supervisors' offices to classrooms on those levels, and individual call or general call to all units within the building through the main board in the second floor main office. This system also provides for the instructor to call either of the supervisors' offices from the shop.



SECOND FLOOR

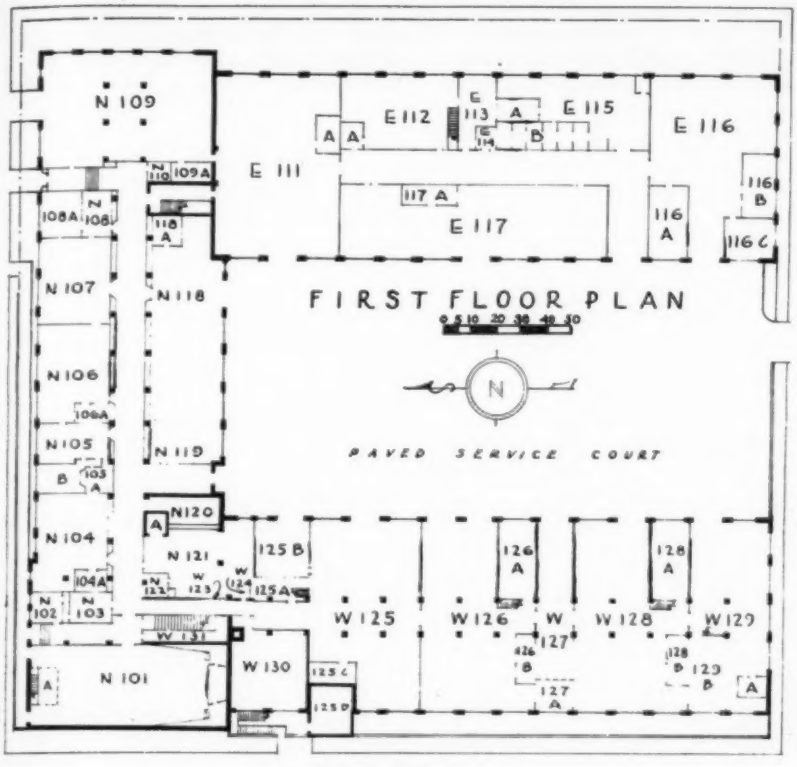
North wing: 201. Conference; 202. office; 202A. supervisor; 202B. secretary; 202C. director; N-203. guidance; N-203A. office; N-204. practical nursing; N-204A. office; N-204B. utility; N-204C. practice; N-204D. classroom; N-204E. nutrition; N-204F. living room; N-204G. bedroom; N-204H. locker; N-204I. bathroom; N-205. commercial art; N-205A. toolroom; N-206. upholstering room; N-207. commercial dressmaking; N-207A. fitting room; N-208. power sewing; N-209. women's restroom; N-210. custodian; N-211. women instructors; N-212. radio shop; N-212A. toolroom; N-212B. testing booths; N-213. men instructors; N-214. men's restroom; N-215. storage and freight elevator; N-216. phone booth

West wing: W-217. Pass window; W-218. drafting room; W-219. blueprint room; W-220. drafting room; W-221 and W-222. dining room; W-222A. staff dining room; W-222B. refrigerators (walk in); W-222C. men's locker room and shower; W-222D. women's locker room and shower; W-222E. instructor's office; W-222F. kitchen and food preparation; W-223. reception room; W-223A and W-223B. dressing room; W-224. beauty shop; W-224A. facial; W-224B. dispensary; W-224C. shampoo; W-225. barber shop; W-226. watch and jewelry repair; W-227. applied science; W-228. library; W-228A. study room

Each shop is equipped with adequate sink facilities for wash-up purposes, and most shops have self-contained locker facilities for accommodating the students' working garments. All general locker facilities are built into the wall in the halls eliminating the cleaning problem so common with exposed locker installations.

Dressing rooms are provided for the public in the beauty shop. Dressing rooms, toilet facilities and showers are provided for the students in the beauty shop, kitchen, practical nursing, and instructors' lounge.

Storage facilities are provided in each and every shop in the form of built-in cabinets. These cabinets are approximately 7 ft. high by 6 ft. wide by 24 in. deep, and include space for outdoor clothing and shop uniforms, four reference bookshelves, six shelves about 18 in. wide for small supplies and materials, three large and two small drawers for miscellaneous use. Also, each shop has adequate supply space for the storage of materials, parts, and tools. The shop units on the first floor are equipped with large toolrooms, using the shadow board type of tool display and with a student check system for tool control. Also, the three woodshops and the electrical shop have lofts above the classrooms for material



FIRST FLOOR

North Wing: N-101. Visual education; N-101A. projection room; N-102. supervisor; N-103. first aid; N-104. masonry and plastering; N-104A. toolroom; N-105. offset room; N-105A. darkroom; N-105B. camera room; N-106. press room; N-106A. stock room; N-107. composing room; N-108. editorial room; N-108A. art planning; N-109. Diesel shop; N-109A. toolroom; N-110. re-melt room; N-118. sheet-metal shop; N-118A. toolroom; N-119. sheetmetal shop; N-120. men's restroom; N-121. storage; N-121A. freight elevator; N-122. stock clerk.

West wing: W-123. Pass window; W-124. phone booth; W-125. electrical shop; W-125A. toolroom; W-125B. classroom; W-125C. instrument testing room; W-125D. transformer vault; W-126. boat shop; W-126A. classroom; W-126B. toolroom; W-127. assembling room; W-127A. paint room; W-128. millwork shop; W-128A. classroom; W-128B. toolroom; W-129. carpenter shop; W-129A. toolroom; W-129B. classroom; W-130. boiler room; W-131. custodian.

East wing: E-111. Auto shop; E-111A. toolroom; E-112. plumbing shop; E-112A. toolroom; E-113. men's restroom; E-114. custodian; E-115. welding shop; E-115A. toolroom; E-115B. welding booths; E-116. body and fender shop; E-116A. paint shop; E-116B. toolroom; E-116C. classroom; E-117. machine shop; E-117A. tool shop

storage. Adjacent to each shop in the court, concrete bins with watertight covers have been provided for the accumulation of scrap materials. Three storerooms, one on each floor, connected by a freight elevator, maintain the requirements for instructor and student supplies.

The three woodshops are exhausted by one unit with storage of sawdust and shavings in a large bin in the court. This system provides individual exhaust tubes to each machine and also a floor sweep in each area of the shop. The bin itself is provided with two hand-operated gates, allowing the sawdust to be dropped into trucks and hauled to elementary schools in the Tacoma system where it is used for heating purposes. This exhaust system functions very well in so far as its purpose; however, individual exhaust systems for each shop would materially cut down the cost of operation and noise factors caused by one shop needing the system during the period of related instruction in the other shops.

The exhaust system for the Diesel and automotive shops is of the overhead type with flexible tubing drops to connect with the exhaust pipes on the machinery in operation. The science laboratory makes use of an exhaust fan for the room, and also an individual exhaust unit for the gas chamber.

Paint, oils, gasoline, and greases of flammable nature are stored in a reinforced concrete vault in the court, and control is maintained through the storekeeper and automotive instructor. These materials are issued in the amounts to be used for any one job, thereby eliminating any chance of a concentration building up in the shop or shop's storeroom.

The printing shop is equipped with its own darkroom for the development and printing of negatives. Also, a re-melt room is provided which is separate from the shop space and individually exhausted.

Recessed lighted display windows are located in the main foyer, and shop projects of an interesting and outstanding nature are displayed.

Heating and ventilating are provided in two ways in the building. The shops on the first floor are heated by steam coils attached to the side walls and covered with grillage, providing convector type of heating. The shops on the second and third floors have Sturtevant unit type of heaters, which take air in through an opening in the outside wall and force it over a steam radiator which is thermostatically controlled. As the temperature of the room reaches the maximum setting, the air valve cuts off the steam and fresh air continues to be brought in from outside. This heating system has proved to be most satisfactory, and the unit type of heater can be highly recommended for classrooms.

All shops, shown on the set of accompanying plans, have an ideal ratio of length to width, providing adequate work station area for each pupil. The equipment is arranged to provide the best possible flow of materials in the heavier shops and to provide related activity centers in the service shops. The machine shop, as you will note, is a part of the original building, and is possibly the only doubtful shop as to arrangement in our school. This shop is quite narrow in relationship to the length, and plans have been prepared to enlarge it and make it more nearly 2 to 3 in width to length ratio.

You will note that the carpentry shop has space provided for the construction of live projects, many of which are built during the school term, relating to house construction. The school board has also approved and financed the construction of three portable units for elementary school use, and we contemplate additional unit construction in the future. The carpentry shop lays out the site, constructs the forms,

makes arrangement for concrete pedestal placement, does all the framing, siding, and interior finishing, and applies roofing. The electrical shop does all the necessary wiring and the sheet-metal shop provides the heating and ventilating connections to unit oil heaters. This type of project can be highly recommended, as it is 100 per cent practical and provides the student with multiple opportunities for exercising everyday skills.

The automotive, Diesel, sheet-metal, body and fender, radio repair, beauty shop and barber shop, take in projects which are completed by the students under close supervision for which the owner pays the list cost of the parts; the percentage difference between our wholesale price and the retail price being used for ordinary shop supplies, such as grease, rags, and abrasives. This system has worked out very well, the student body having first option on these services.

The radio broadcasting studio is perhaps one of the outstanding units in the country, including commercial, as well as training, installations. This unit offers a large room for script preparation and production training, and a repair shop for technical training and repair. The control room is centered between a large studio for larger productions and a small unit for news casts, radio interviews, etc. The transmitter is a Western Electric 1000 w, and is maintained and serviced by the students. The class is divided, and one half is under the supervision of a technical instructor for three hours, and then is transferred to the production instructor for three hours. This provides a student with all phases of FM operation and production. The transmitting tower is located on top of the building, directly above the radio studios. The studios are completely soundproofed. The programs presented over KTOY are instructional and entertaining in nature, many of them being educational programs for elementary, junior high, and senior high school students. The talent in many cases is provided by these same school children and by the students in our own vocational-technical school. The intention is to beam outstanding educational material to all of the schools of the city in the future. The radio station is on the air from 9:30 a.m. to 2:30 p.m., Monday through Friday. The students set up their own program board, which includes news broadcasts, sport commentary, educational dramatizations, recorded music, civic service programs, and interviews with people of interest in our community.

The lighting requirements indicated on the shop layouts were so specified to produce approximately 40 per cent surplus lighting over recommended requirements. The purpose was to allow for the diminishing light values resulting from dust accumulations and general deterioration of the reflecting efficiency of the walls.

Toward the Ideal General Shop

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The concept of providing many exploratory activities with varied industrial materials and tools within a single shop, while it started as an economy measure, has progressed to a recognized status in the field of industrial-arts education.

With the rapid changes which take place within our industrial economy, with the newer techniques evolving, it is felt that a great need for adaptability and versatility will be increasingly necessary in the future.

If this is so, it seems that the interrelation of materials, tools, and industrial techniques should form a substantial part of the general educational background of nearly every boy and girl who expects either *to work* or *to live* in our complex industrialized civilization.

Toward this end, the presently described "generalized" shop is "designed." This shop is further designed within the limits of architectural practicality for the writer knows from experience the reluctance of many to accept anything too radically different from present practice.

The ideal general shop, therefore, as envisioned will be nearly square in shape. Its area will comprise from 2500 to 3000 sq. ft. It will accommodate, for safety purposes and reasonableness, from 15 to 20 students, thus providing at least 125 sq. ft. per student.

It has a half-glass enclosed finishing room situated in the center of one outside, fenestrated wall. This room needs to be about 10 by 12 ft., with a door in the center. When the finishing room is thus situated, two additional work corners are provided in the shop.

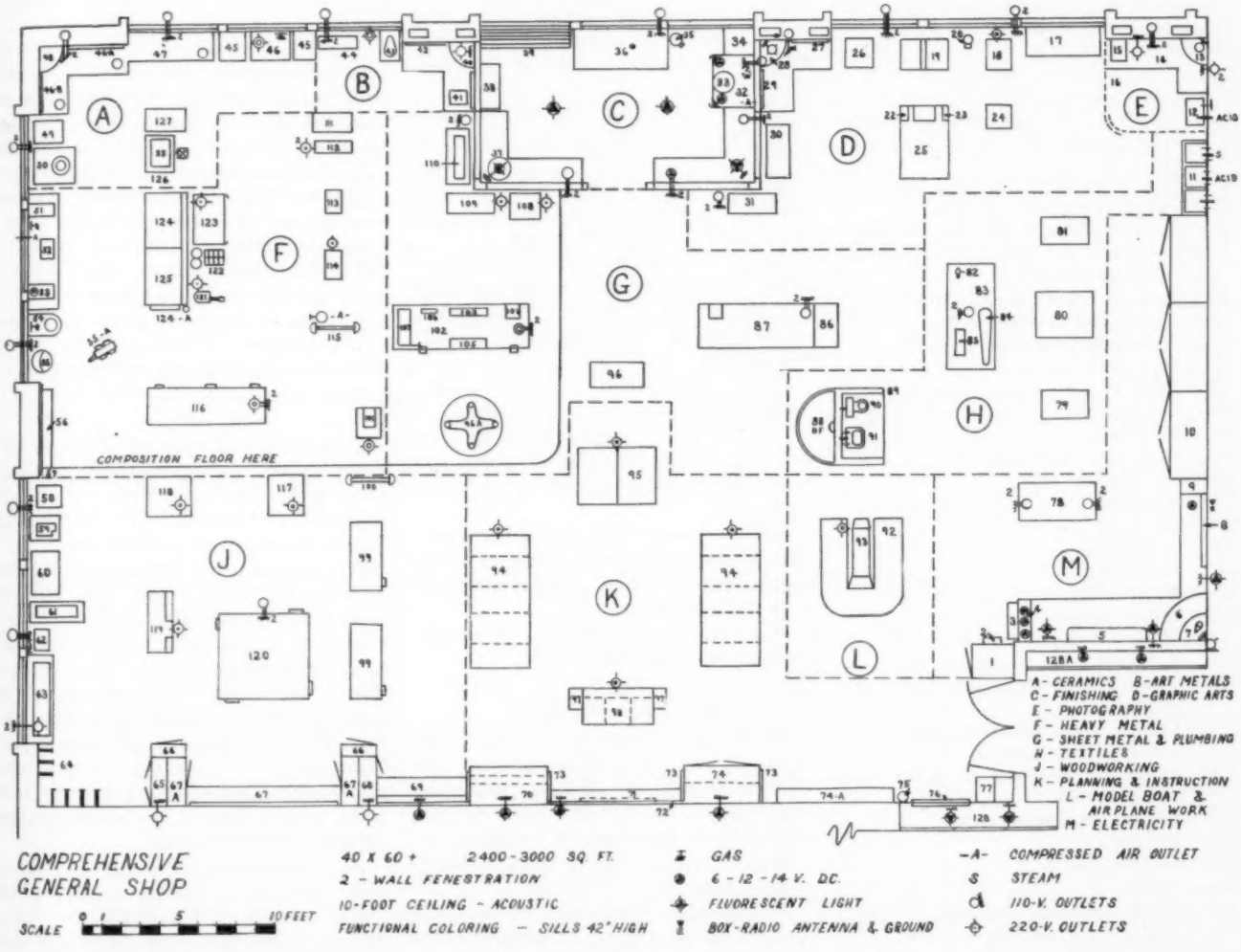
Across from the finishing room is the planning area and class instructional unit. This area, provided with movable equipment, is maintained at about 16 by 20 ft. to allow for a teacher's desk and files, two large conference tables with drop ends, an audio-visual storage and projection cabinet, a projection screen, demonstration mirror, and separately lighted chalk board of green glass.

For the purpose of clarity the following additional description is given in numerical order progressing counterclockwise from the entrance of the room.

Item — *Title or Description*

1. Model airplane panel storage cabinet, with large, shallow drawers and horizontal slide-in panels for layout
2. First-aid cabinet
3. Electroplating ledge
4. Electro current panel for student work with a.c. and d.c. panel to be provided with nonexchangeable leads for high and low tension. Polarized plugs for d.c. current.
5. Meter storage cabinet with glass front
6. Weather station, apparatus on roof of building, instruments in shop
7. Corner cupboard for storage of radio, electrical equipment
8. Electrical tool panel for pliers, fuse pullers, insulated screw drivers, etc.
9. Radio test panel wired for tube checking, etc.
10. Storage cupboards, 3 ft. deep equipped with large drawers in bottom section and shallow trays in upper. Top of cupboard for display of models.
11. Dye vats, for textile work, provided with acidproof drain
12. Photo-sink, shallow, with special overflow for film washing
13. Corner cupboard for photo supplies
14. Photo workbench, storage underneath
15. Photographic enlarger
16. Darkroom curtain hung on sliding rail from ceiling
17. Bookbinding bench, storage underneath
18. Power printing press, chase size about 10 by 12 in.
19. Type cabinet-double style
20. Rag disposal can
21. Printers composing stone

Item	Title or Description
22.	Printing, furniture stand
23.	Printing, reglet stand
24.	Paper cutter
25.	Printing materials table
26.	Hand operated printing press, chase 8 by 10 in.
27.	Tool panel for printing tools and press equipment
28.	Corner cupboard for storage or display of printing materials
29.	Rubber stamp and linoleum block printing table
29-A	Bulletin board for printing samples
30.	Mimeograph and ditto machine stand
31.	Photo-copy or blueprint machine
41.	Electric oven for heating of plastics
42.	Tool panel for art metal and jewelry tools
43.	Lapidary (gem cutting) machine
44.	Metal spinning lathe
45.	Clay storage bins (2)
46.	Kiln for ceramics ware
46-A	Tool panel for ceramics tools
46-B	Bulletin board
47.	Ceramics workbenches, storage underneath
48.	Corner cupboard for ceramic display
49.	Ball mill for glaze grinding
50.	Potter's wheel, power driven
51.	Soldering furnace (gas)
60.	Utility bench (metal top, ¼ in. thick boiler plate for nailing)
61.	Jig saw
62.	Grinder (light duty, for tools only)
63.	Wood-turning lathe
64.	Vertical lumber storage rack
65.	Stock cupboard
66.	Woodwork hardware cupboard
67.	Tool panel for woodwork tools
67-A	Storage area for unfinished woodwork
68.	Storage cupboard, supplies
69.	Carving stand — 42 in. high with glass enclosed tool panel and full length fluorescent light
70.	Bookase. Magazine display. Magazine


COMPOSITION FLOOR HERE
A - CERAMICS B - ART METALS
C - FINISHING D - GRAPHIC ARTS
E - PHOTOGRAPHY
F - HEAVY METAL
G - SHEET METAL & PLUMBING
H - TEXTILES
J - WOODWORKING
K - PLANNING & INSTRUCTION
L - MODEL BOAT & AIR PLANE WORK
M - ELECTRICITY
COMPREHENSIVE GENERAL SHOP
SCALE 0 1 5 10 FEET
40 X 60 + 2400 - 3000 SQ. FT.
2 - WALL FENESTRATION
10-FOOT CEILING - ACOUSTIC
FUNCTIONAL COLORING - SILLS 42" HIGH
GAS
6 - 12 - 14 V. DC.
FLUORESCENT LIGHT
BOX-RADIO ANTENNA & GROUND
-A- COMPRESSED AIR OUTLET
S STEAM
110-V. OUTLETS
220-V. OUTLETS

Item	Title or Description
32.	(Inside finishing room) Spray booth with outlet for fumes, and vapor proof lighting
33.	Turn table for finishing
34.	Wood drying shelves for models
35.	Oily rag disposal can
36.	Finishing workbench
37.	Turn table for finishing
38.	Paint service cupboard
39.	Wires, stretched for drying models
40.	Corner shelf for lapidary supplies
52.	Quenching tank for metalwork
53.	Induction furnace for heat-treating (electric)
54.	Crucible furnace
55.	Forge N.B. Exhaust hood over Nos. 51 to 55A inclusive concrete floor area indicated . . . ,
56.	General metal supply cupboard
57.	General metal tools
58.	Wood shaper
59.	Disk sander
	storage in back of display space
71.	Daylight projection screen (roll type)
72.	Green glass chalk board with independent lighting
73.	Bulletin board
74.	Storage cabinet for teaching aids
74-A	Coat rack for students' clothing. Book and hat shelf on top. Footwear shelf underneath.
75.	Fire extinguisher
76.	Light and power panel with master con-

Item	Title or Description
	trol for machines
77.	Teacher and visitor lockers
78.	Electric appliance repair table, shelf underneath, parts drawers under top
79.	Table for small looms, textile equipment, tools
80.	Floor type rug loom
81.	Table loom and storage cupboard
82.	Shoe repair last
83.	Clothing maintenance table
84.	Ironing board
85.	Sewing machine (heavy duty with 360-deg. presser foot)
86.	Model gas engine stands with exhaust removal system
87.	Bicycle maintenance and repair center
88.	Wash stand (Bradley half-type with drinking fountain)
89.	Plumbing cubicle
90.	Water closet — connected
91.	Sink, pedestal type
92.	Workbench for model airplane work
93.	Wind tunnel and model materials storage stand
94.	Planning tables, with drop leaf ends and catalog storage in center
95.	Double drafting bench with adjustable top boards and storage underneath for projection cameras
96.	Squaring shears for sheet metal
96-A	Sheet metal machines and stand
97.	Student personnel files
98.	Instructor's personal desk
99.	Single station woodwork bench (3)
100.	Window sash and screen unit on stand
101.	Drill press
102.	Sheet-metal worktable
103.	Slip forming rolls
104.	Bench anvil
105.	Bar shear
106.	Stake plate
107.	Bar folder
108.	Metal milling machine
109.	Metal shaper
110.	Machine lathe on cabinet stand
111.	Hydraulic press
112.	Buffing machine for art metal and jewelry
113.	Grinder, heavy duty for metal
114.	Metal nibbling machine
115.	Pneumatic panel for air power tools and equipment
116.	General metal workbench
117.	Band saw
118.	Circular saw
119.	Jointer
120.	Wood workbench, 4-station
121.	Spot welding machine
122.	Gas welding equipment
123.	Arc welding booth
124.	Foundry workbench
124-A	Fire blanket and extinguisher (foam type)
125.	Foundry pattern storage
126.	Deep service sink with clean-out trap for ceramic work
127.	Green ceramic ware storage cabinet
128.	(Near entrance) Showcase with sliding glass door panels and softwood background. Adjustable shelves.
128-A	Shallow display case with swinging glass doors and cork background for drawings, charts, photographs

The equipment and areas herein included provide for the fabrication of varied materials and for the manipulation and use of many tools and machines. It also makes possible exploration and experimentation in the following classifications of industrial and handicraft experiences.

Metal Fabrication: machine metalwork, sheet-metal work, art metal and jewelry, foundry, welding, forge work, heat treating.

Wood Fabrication: cabinetmaking carpentry, carving finishing, wood turning, wood inlaying, wood forming (steam), patternmaking.

Textile Fabrication: clothing maintenance, shoe repair, leather craft, weaving, dyeing.

Graphic Representation: drawing, job printing, mimeographing, photography, silk screen printing, bookbinding.

Power Utilization: communication — radio, telephone, telegraph. Transportation — model planes, autos, trains, boats, scooters and bicycles. Air, water, gas, electric, solar, steam.

Plastic Fabrication: chemurgic plastic forming, glass and concrete, ceramics.

Preservation — Finishing — Decoration: woods, metals, leather, paper, ceramics, glass, concrete, textiles, chemurgic plastics.

Home Appliance Repair: irons, toasters, heaters, motors, vacuum cleaners, lamps, extension cords, radios, clocks, tools, toys, lawn mowers, garden hose.

Probable Future Expansion: jet propulsion (model), television.

Architectural Details

Floors: Strip wood 1⅛ in. thick over ¼-in. plywood subfloor on sleepers over concrete, except nonskid composition of heat resisting quality or colored concrete with abrasive finish, where indicated.

Walls: Ceramic tile to dado. Acoustic plaster above dado.

Fenestration: Two adjacent sides of room, translucent glass, no projecting sills inside room.

Ventilation: Forced conditioned air and/or adjustable windows. Separate outlet with fan over heat-bench area, over spray booth and through floor to Station No. 86 (Model Gas Engines).

Dust Removal: Independent suction bags on sander and grinders, and wood turning lathe.

Cabinets: Painted softwood, work surfaces hardwood 1½ in. thick, built fully enclosed to the floor with toe space provided. Corners rounded; insides painted all over white, with enamel on bearing surface of shelves. Solid doors at least ¾ in. thick fitted with master lock system.

Tool Panels: 1-in. close grain plywood with frame. Securely grounded to wall under frame. Provide with shelf overhead where indicated.

Bulletin Boards: Framed cork board cemented to plywood grounded to wall as unit.

Coloring: To be functional according to recommendations for restfulness and utilization of color for safety and identification.

Lighting: Over-all ceiling lights to provide 50 foot-candles at desk height. Localized lighting to provide 100 foot-candles at indicated work surfaces. Special lighting for darkroom area. Independent light to be provided and operable at chalk board.

Power: 220v, 3-phase, 60 cycle for power machines as indicated by symbol. 110v outlets (double) as indicated on walls, standard height, 6-12-14v. Direct current to be provided at Stations 3 and 4.

Facilities: Compressed air at 150 lb. per sq. in. available at Station 115. Steam at 10 lb. at Stations 11 and 60. Hot and cold running water at Stations 11, 88, 91, 12, 126.

Drains: Special acidproof drains at Stations 11, 12. Special clay trap available for clean-out at Station 126.

Special Installation: (*a*) Facilities at Station 89 are to be installed for instructional purposes only. Therefore piping will be available under raised false floor of loose board construction held with brass screws to frame. Inside panels will also be removable for trouble shooting and repair. (*b*) Black cloth curtains to be hung on track at Station 16 so that curtains will form lightproof area when closed. When not in use, curtains to open back into boxlike enclosure. (*c*) Lumber rack to be vertical type of special construction securely fastened to wall.

In conclusion, this pictures a nearly ideal shop for composite activity which would furnish a rich exploratory background, some elementary skills and provide for the maximum development of adaptability.

The big problem, as in all well-integrated programs, would be to find the teacher sufficiently versatile to teach the program as envisioned. It might be, pending training of individual persons, that two or more teachers could work together or rotate within a situation as is now done in comprehensive homemaking courses.

School-Shop Expansion in Sharon, Pennsylvania

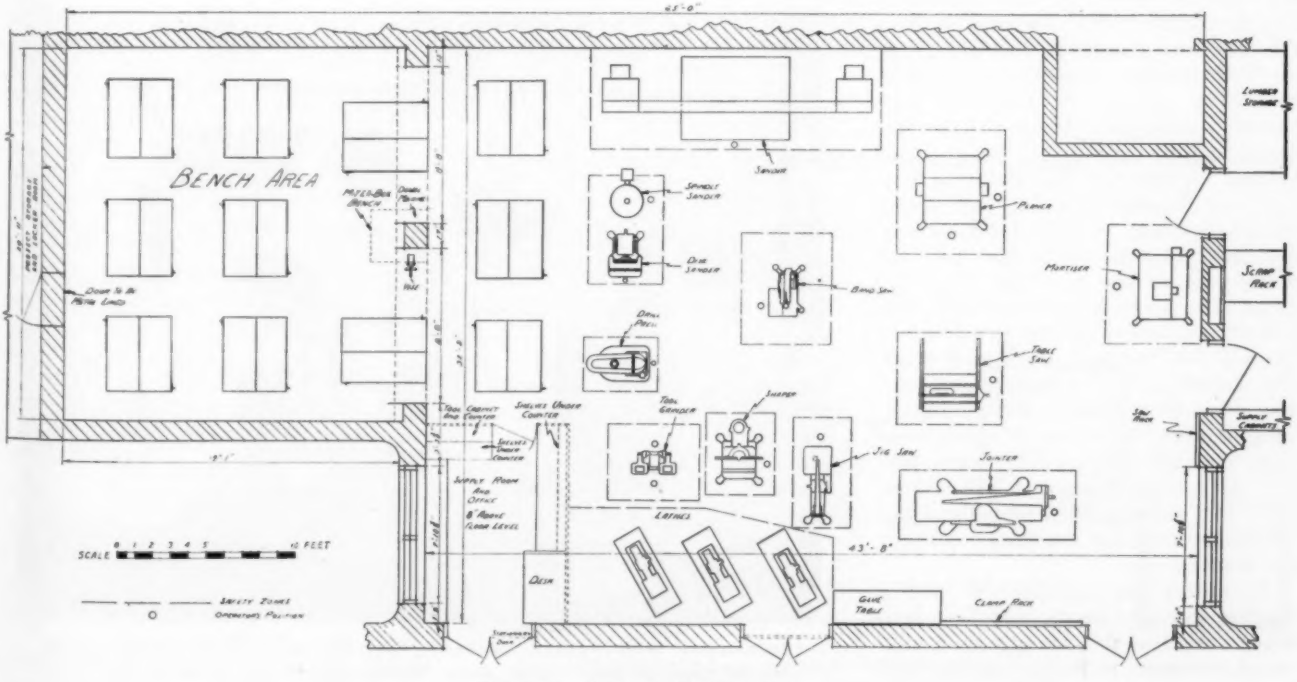
F. N. NEWTON, JR.
Industrial Education Department
Sharon City Schools
Sharon, Pa.

In 1946 an expansion program was started for the industrial-education department of the Sharon public schools. The school board at the time had tentative plans to build a field house, which when built would release the entire basement area of the senior high school for shop expansion. The plans were drawn and the bid sheets sent out but when the bids came in, they were found to be too high to warrant a building, so that phase of the program was dropped. We have a progressive superintendent and he refused to let the idea die. Early last spring an architect was employed to draw further plans to enlarge our present gymnasium and provide for a new cafeteria. The cafeteria at the time was located in the basement of the high school. The drawings were made and specifications sent out for bids. When the bids came in the contract was let and in the latter part of June the work was started. The cafeteria was moved to reconditioned rooms on the first floor and the basement area was then made available for shops.

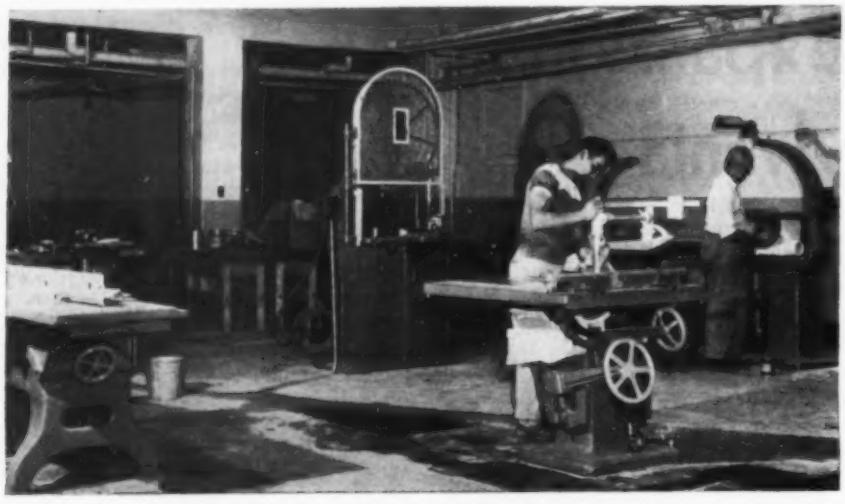
Previous to this year all of our shops were in one of our high schools located in the downtown area and we were sending our high school students from our senior high school to the shops four days each week. This was never a satisfactory procedure, for the downtown building was a mile from our senior high school.

Work was started on moving out the cafeteria equipment about July 1 and the large cafeteria room was made available to set up a new woodshop. All of the teachers in the industrial-education department were given an opportunity to express themselves on ideas for the new shop. Patterns were made from wrapping paper to the approximate size of each machine and Mr. Gubser, one of our woodshop teachers, and the writer spent several hours moving the patterns around until we felt the spacing was satisfactory from every angle for a good shop setup. The shop is being taught by Mr. Franko and he also spent some time during the summer helping to set up the shop and get it ready for operation before school opened in the fall. We moved all of the equipment from the downtown school to the senior high school and our machine-shop teacher, Mr. Pile, and the writer proceeded to level up the machines and anchor them to the floor. Mr. Pile then gave the machines a complete overhauling. As we had two woodshops in our downtown high school, this move did not harm our program in any way at that school. Once anchored to the floor, we then dug the trenches for the conduit so that we might wire each machine under the floor and to a central panel. We used 475 ft. of conduit in order to connect all of the machines and run them to this central panel.

When that was taken care of, we proceeded to paint all of the machines and



The new shop at Sharon, Pa.



Picture of woodshop before floor was painted

the floor area. We followed the idea as advocated by the Pittsburgh Paint and Glass Company who had made studies on color dynamics as applied to various shops, both for school and industry. We used machine enamel and applied two coats to all machines and the floor, and applied it with a brush rather than a spray gun. Each machine has five colors on it. The main body of the machine was painted a vista green or a moss green; all movable parts such as hand wheels, knobs, etc., were painted orange, all guards or anything applied to electricity such as switches, motors, etc., were painted red, and around the edges of tables, the lathe tailstocks, etc., were painted ivory. The walk areas on the floor were painted a light gray, and a suitable distance in line with safety and workability around the machines were painted a dark gray. Dividing these two shades of gray was a 2-in. safety zone painted red with the idea that at no time was more than one boy to be allowed inside of the safety zone when the machine was running. This was in line with the safety program that we follow in all our shops. The woodworking vises were also painted vista green. We are very proud of our new shop and have had a good many compliments on it now that it is finished and in use, for it not only makes a beautiful appearance, but the writer is convinced that following this color dynamics idea will pay real dividends in shopwork both from the standpoint of safety and the cheerful attitude that it creates on student and teacher.

To further our expansion, we plan a machine shop and electric shop next year. When completed this will give us a well-rounded program in both of our city high schools.

KNOW AND OBEY TRAFFIC LAWS

Here are three rules of the road which the National Safety Council believes are commonly misunderstood by motorists. Even if you are lucky enough to escape injury yourself, you may be liable under the law for damage to other vehicles or persons.

The Intersection Rule: If two cars arrive at an intersection without stop signs or signals at about the same time, the car on the right always has the right-of-way. You must give way to it.

The Following Rule: If you run into the rear of another car, you are always at fault. It doesn't matter that the car ahead stopped suddenly or that the driver failed to signal — he may have had no opportunity. The law requires that you drive far enough behind to be ready for any emergency. Safety authorities recommend one car length for every 10 miles of speed.

The Speed Rule: In all states speed must be adjusted to conditions regardless of posted speed limits. A speed limit of 35, for example, means that is the maximum safe speed under ideal conditions. If traffic is heavy or if the roadway is slippery, 35 miles an hour may be too fast for safety. If you have an accident, you may be charged with "speed too fast for conditions" even though you did not exceed the legal limit. On rural highways without speed limits, the "reasonable and prudent" rule still applies.

The average daily accident death toll in the winter months last year was 265, in the fall 270, in the spring 251, and in the summer 284. — *National Safety Council.*

Tire chains provide a necessary link between winter driving and safety. — *National Safety Council.*

When cold weather keeps people indoors, home accidents go up. Home fatalities were fewest last year in June, July, and September — 2500 each month — and most numerous in January and December — 3500 each. — *National Safety Council.*

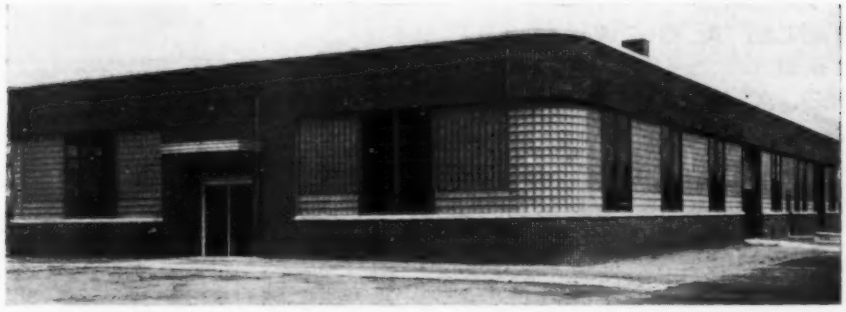
Elementary woodworking students working on a stage setting at the Senior High School, Tucson, Ariz. Photograph by Mike Perez. Submitted by Harry A. Goldstein, instructor of photography

Bergen County Vocational School

HAROLD A. WEIDELI

Director, Bergen County Vocational School

Hackensack, N. J.



Shop apprentice training building of the Bergen County vocational schools, Hackensack, N. J.

The apprentice training building of the Bergen County Vocational Schools is unique in that it is the only school building in New Jersey which was constructed exclusively for the training of apprentices.

The apprentice program in Bergen County was started in September, 1945, in two rooms loaned by the Bergen County Police Department. The rapid increases in the program, due to veterans returning and entering into apprenticeship, made it necessary to acquire additional space in one of the local high school buildings. It soon became apparent that additional facilities would be needed and especially for demonstrating shop processes. Construction was started on the apprentice training building in November, 1947, and the building, after numerous delays, was completed in February, 1949.

The building is 72 ft. by 162 ft., approximately 12,000 sq. ft., and is built with a steel frame and brick walls. The floors are concrete and the building is heated by radiant heat panels embedded in the floor. Some of the partitions are of cinder block construction, while others are constructed of brick, laid by the bricklaying apprentices. The cinder block partitions are to be utilized in the training of plastering apprentices. The brick partitions constructed by the apprentices are 14 ft. high and are laid in cement mortar. Various bonds, brick patterns, and arches are introduced into each wall so as to provide as much instruction as possible for the apprentices.

The carpenter apprentices constructed all of the drafting tables, study tables, tool cabinets, and other articles of furniture and equipment necessary for the several shops and classrooms.

The painting and decorating classes finished the articles produced in the carpentry shop. In addition they have painted a number of signs used about the building and they also painted the steelwork.

The electrical apprentices have had various opportunities to add to their practical experience. Some of the jobs which they have completed include: installation of floor lights for parking lot; signal horns, temporary lights for bricklayers, rewiring motors and machines.

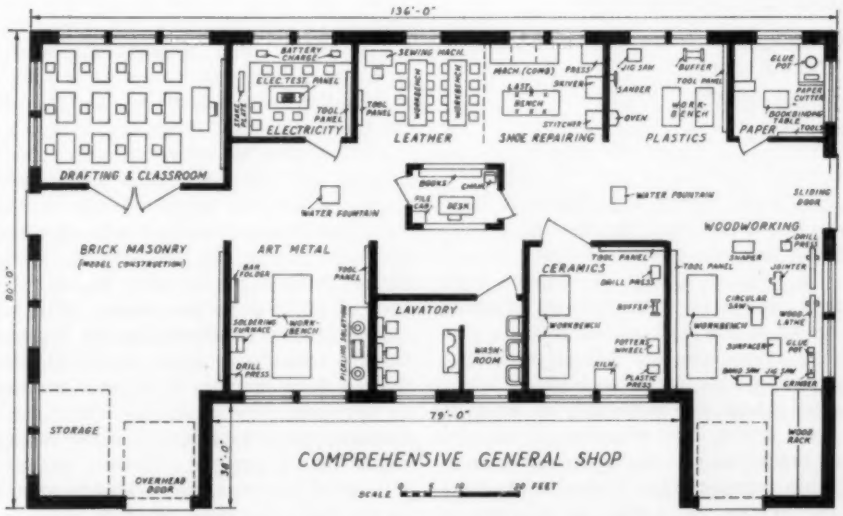
The total number of apprentices enrolled now totals 750, and many of these are in the building trades. The advisory committees for the various building trades have recommended that in addition to the 144 hours a year of related instruction that the apprentices receive approximately 80 hours a year of instruction in shop processes.

The new apprentice training building houses the following shops: carpentry, cabinetmaking, upholstery, masonry, plumbing, oil burners, sheet metal, painting, electrical, radio, refrigeration, drafting, auto mechanics, and machine shop.

SOME QUOTES ON VETERANS TRAINING

Only one in every 25 veterans who have had education and training under the GI Bill or Public Law 16 no longer is eligible for further training. He either exhausted his entitlement under the GI Bill or was declared rehabilitated under Public Law 16.

Living veterans, on Veterans Administration disability compensation and pension rolls, numbered 2,326,630 as of October 1, 1949. Included were 595 Indian War, 22 Civil War, 97,526 Spanish-American War, 490,028 World War I, 51,146 Regular Establishment, and 1,687,313 World War II veterans.



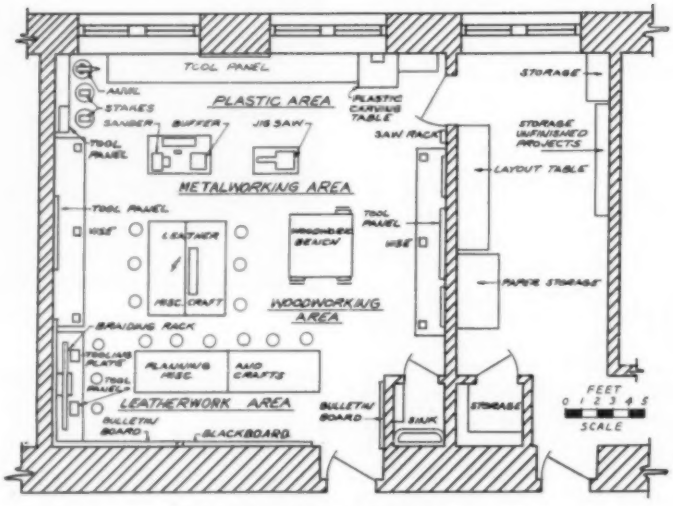
Layout produced by students of the shop planning course, Tuskegee Institute, Ala. Withro McEnge, instructor

Arts and Crafts Shop Plan

STANLEY A. GLOW
and
GEO. A. WILLOUGHBY
Michigan State Normal College
Ypsilanti, Mich.

The accompanying plan illustrates a shop that has been developed as a typical craft shop to provide experiences in types of work commonly called arts and crafts. The chief objectives are to provide opportunities for students to develop the ability to carry on craft activities in schools and in summer camps or school camps now being developed extensively.

This shop provides for the following: leather craft, metal craft, plastics, camp sign craft, miscellaneous crafts, glass etching, plaster of Paris construction, bottle decoration, paper construction, bead work, cork construction, shell craft.



Arts and crafts shop

Curriculum of Milwaukee Boys' Trade and Technical High School

FRED ZIEGENHAGEN
Principal, Boys' Trade and Technical High School
Milwaukee, Wis.

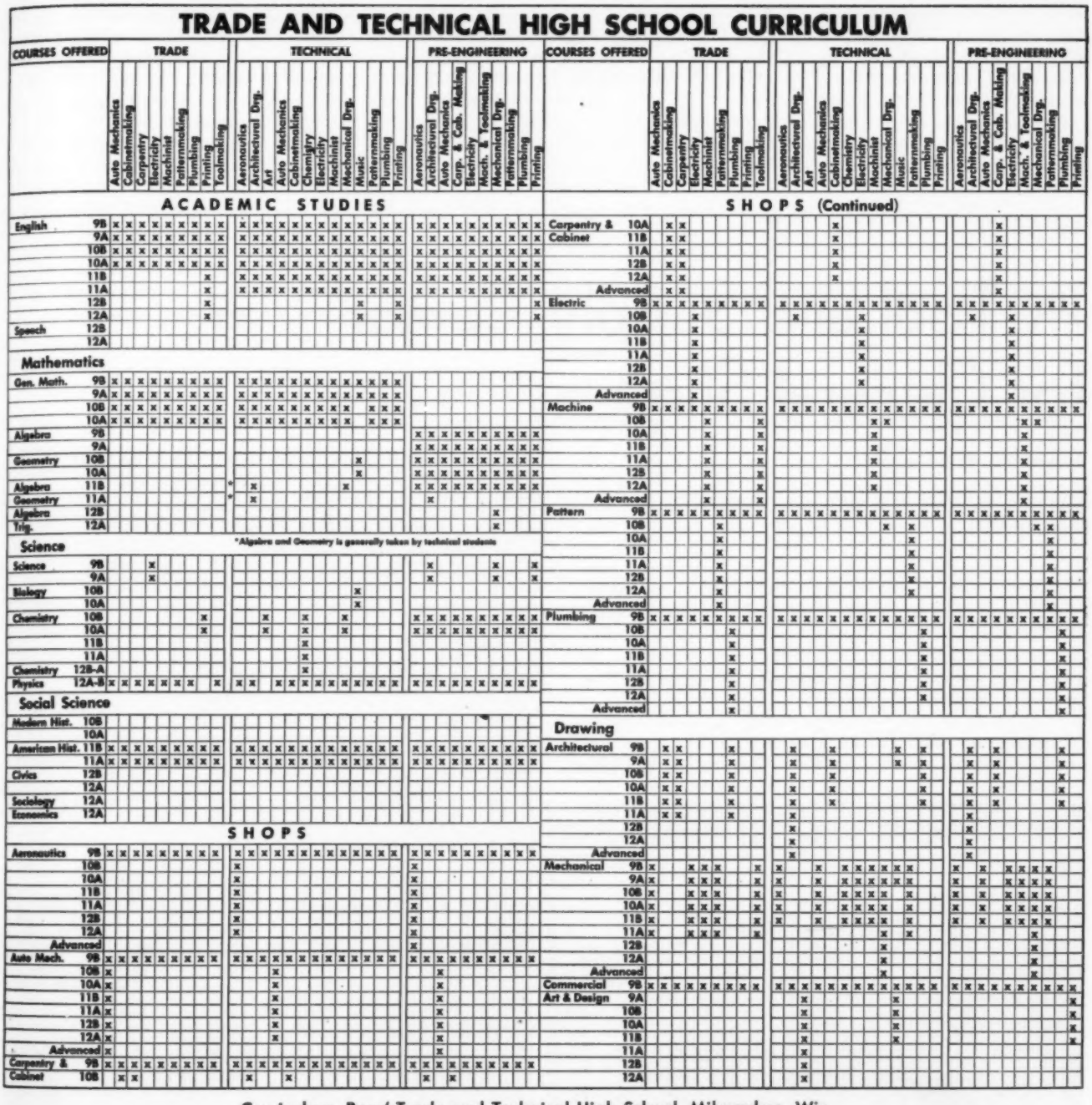
The Boys' Trade and Technical High School is a full-time, regular high school, offering not only specialized trade courses, but a regular college accredited high school course as well. Not all students enrolling in the high school area are preparing themselves for college work, but they may do so, if they so desire.

The school was organized in 1906 as a trade school. The objective of the pioneer organizers was to supplement apprenticeship training. They wished to teach as many of the trade skills as possible in a school setup where production was not one of the prime factors. After the trade school had been in operation about ten years, it became apparent that the public was interested in a broader high school program. It was then that a high school organization was introduced to parallel the trade education setup in our school.

At that time we offered a high school diploma for the boys who successfully completed the high school division, and a trade certificate for those who finished the trade course only, since in the trade division little academic work beyond the ninth or tenth grade was offered. With increased interest in developing the apprenticeship training program, and with the demand from industry that boys entering an apprenticeship should be high school graduates, we reorganized our entire curriculum. After a number of faculty and departmental meetings, we decided to organize the school into three divisions.

First of all, the *trade high school division*, which took over the old trade course, was enriched with academic classwork, without diminishing any of the trade craftswork offered. This arrangement made it possible for the graduate in this division to receive a regular trade high school diploma.

In the second area — *the technical high school division* — students must finish at least six semesters of applied shopwork and five semesters of drawing in order to be graduated. The minimum academic requirements needed to be graduated from this division are six semesters of English, four of general mathematics, or one year of algebra and one year of geometry, two semesters of laboratory science (biology, chemistry, or physics), and two semesters of either American history or senior civics. Since approximately twenty academic credits are needed to be graduated from this division, the balance of the subjects are elective. Students who are graduated from this division may prepare themselves to



Curriculum, Boys' Trade and Technical High School, Milwaukee, Wis.

enter either college or industry. Proper selection of academic courses is necessary if college entrance is desired. Students who enter industry are generally placed as advanced apprentices based on the individual accomplishments of the student.

The third division is a combination of the trade and technical high school courses. Students may plan to enter college or industry, depending, again, on their interests and ability.

The reader will note, by following the graphic analysis shown herewith, that the curriculum is so organized that we are well able to meet various levels of ability if the student is interested in trade or technical education. It happens rather often that students are sent to a trade or a technical school, lacking the aptitude or the ability to make a success of the work offered there.

According to the graphic chart, in the *trade areas* various academic subjects indicated by x are required subjects, with possibly one exception: in mathematics, a student may elect his algebra and geometry in lieu of general mathematics. He may also elect additional work in mathematics, English, science or social science. Only the minimum amount of academic work is here indicated.

In the technical high school area, more emphasis is placed on English, mathematics, science, and social science than in the trade area. The reason for this is that students who are interested and able to

carry on more bookwork, and are less inclined toward concentrated trade shop work, follow this particular division. Students being graduated from this course may prepare themselves for college entrance by electing the proper required academic subjects, or they may prepare themselves for advanced occupational or apprenticeship training.

In the technical and trade division, the two former areas are combined under one heading. Here the student finishes not only his academic work for college entrance or advanced technical work in industry, but also completes the specialized trade work.

It can be seen from this chart that each area is set up on the basis of student ability level. By careful guidance and through the offering of exploratory work in the ninth grade, we try to fit the individual to an area in which we feel reasonably sure he may succeed.

Why do we concentrate on only the few trade areas established in our school? Milwaukee is a community where a vast amount of metal trades work is carried on, both in heavy metal trades industries and in small commercial shops. In the construction field, there is a large area where industry may absorb the product of the school. Fortunately, we have been able, through proper training of the individual, to place our graduates advantageously.

A Tool and Supply Center for General Shop

DELMAR W. OLSON
Professor of Industrial Arts
Kent State University
Kent, Ohio

The requisites of an adequate tools center for the general shop include easy access, easy replacing, easy checking, and often a means for locking. There are many adaptations of the two opposite types, the toolroom and the localized open tool panel. The cabinet described herein is definitely a hybrid, combining the above requisites.

Made from an old, store-type display case, this cabinet houses the necessary tools for a class of 25. The upper right hand side houses woodworking tools. The opposite side holds

Fig. 1. A compact tool and supplies cabinet showing the sliding glass doors removed from one side

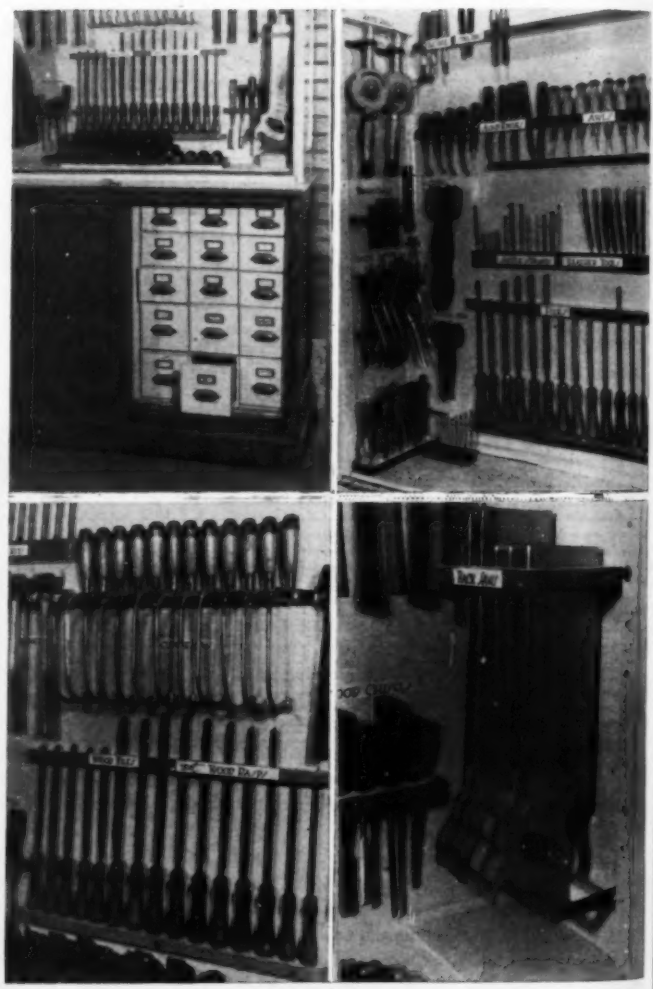


Fig. 2. (top left) Small drawers for nails, screws, and other small parts were built into the base

Fig. 3. (top right) Close-up view of left-hand corner in left side of cabinet

Fig. 4. (lower left) Details of file and coping saw racks

Fig. 5. (lower right) Typical rack used for back and hand saws

tools for metalworking, jewelry, plastics, leather carving, and such.

The cabinet not only stores tools, but displays and identifies them as well. Indirectly lighted, the cabinet adds color and class to the shop. The customary tool outlines and silhouettes are not used.

There is a place for each tool in this cabinet and grouped as they are, checking requires but a glance. The label identification plan is intended to facilitate tool recognition for beginners. The sliding glass doors lift out for easy tool access. The base of the cabinet is filled with small drawers to hold the complete assortment of nails, screws, saw blades, and the like for carrying on the shop activities.

The cabinet exterior is painted a terra cotta and the interior is cream in keeping with the color scheme for the shop. Tools in the right hand cabinet are color coded blue and those in the other, red to facilitate their replacement.

HAPPINESS

There are two ways of being happy. We may either diminish our wants or augment our means — either will do — the result is the same; and it is for each man to decide for himself, and do that which happens to be easiest.

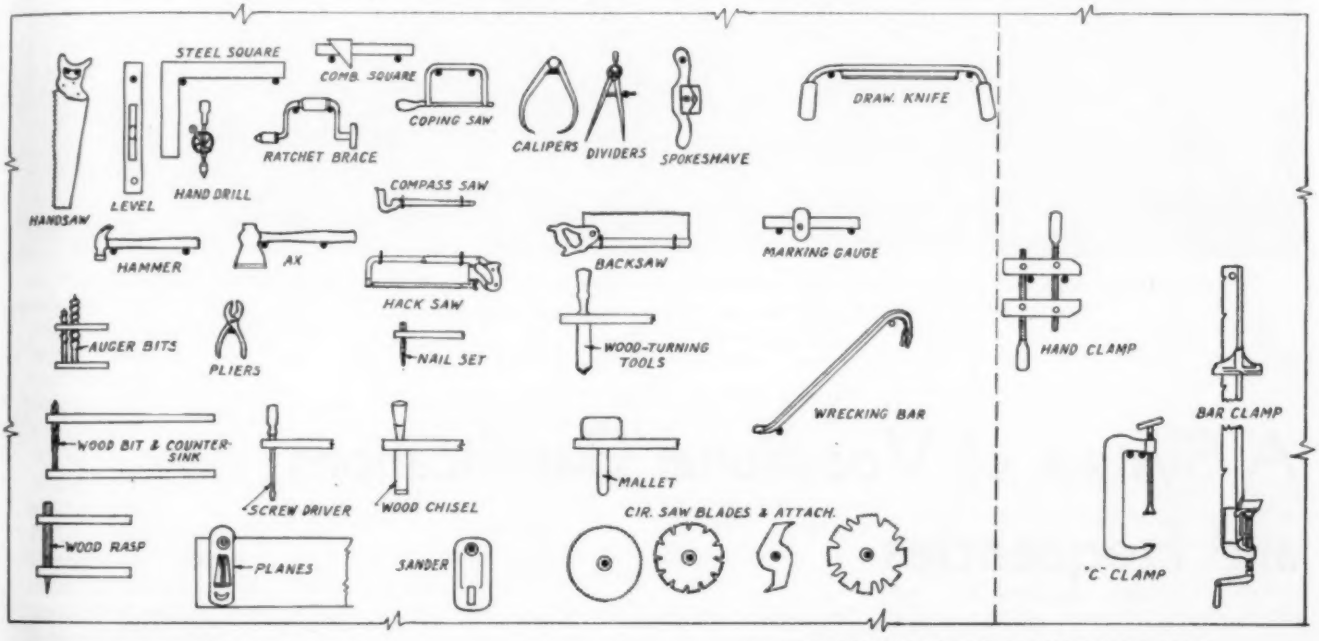
If you are idle or sick or poor, however hard it may be to diminish your wants, it will be harder to augment your means.

If you are active and prosperous or young or in good health, it may be easier for you to augment your means than to diminish your wants.

But if you are wise, you will do both at the same time, young or old, rich or poor, sick or well; and if you are very wise you will do both in such a way as to augment the general happiness of society.

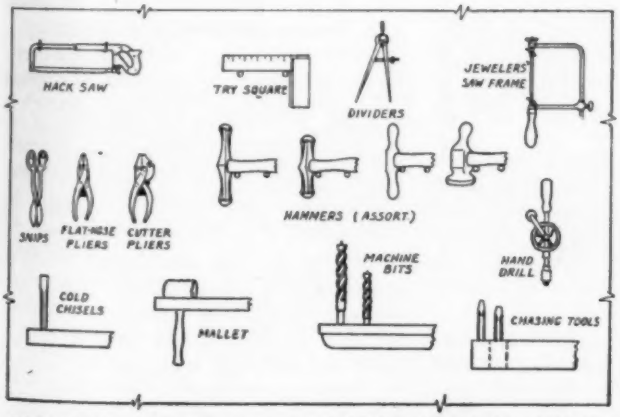
TOOL PANEL LAYOUTS

These layouts of tool panels are the product of the shop planning course, Tuskegee Institute, Ala. Withro McEnge, instructor

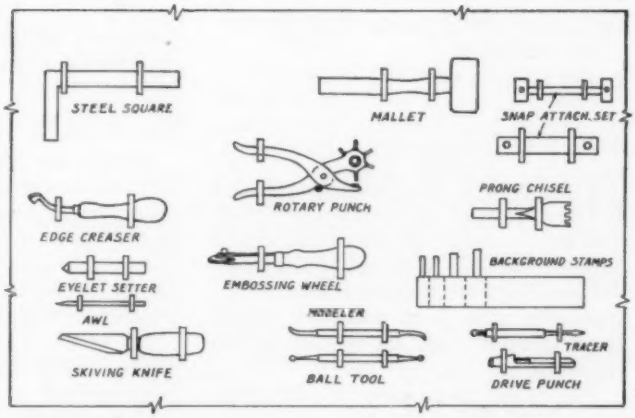


WOODWORK-TOOL PANEL

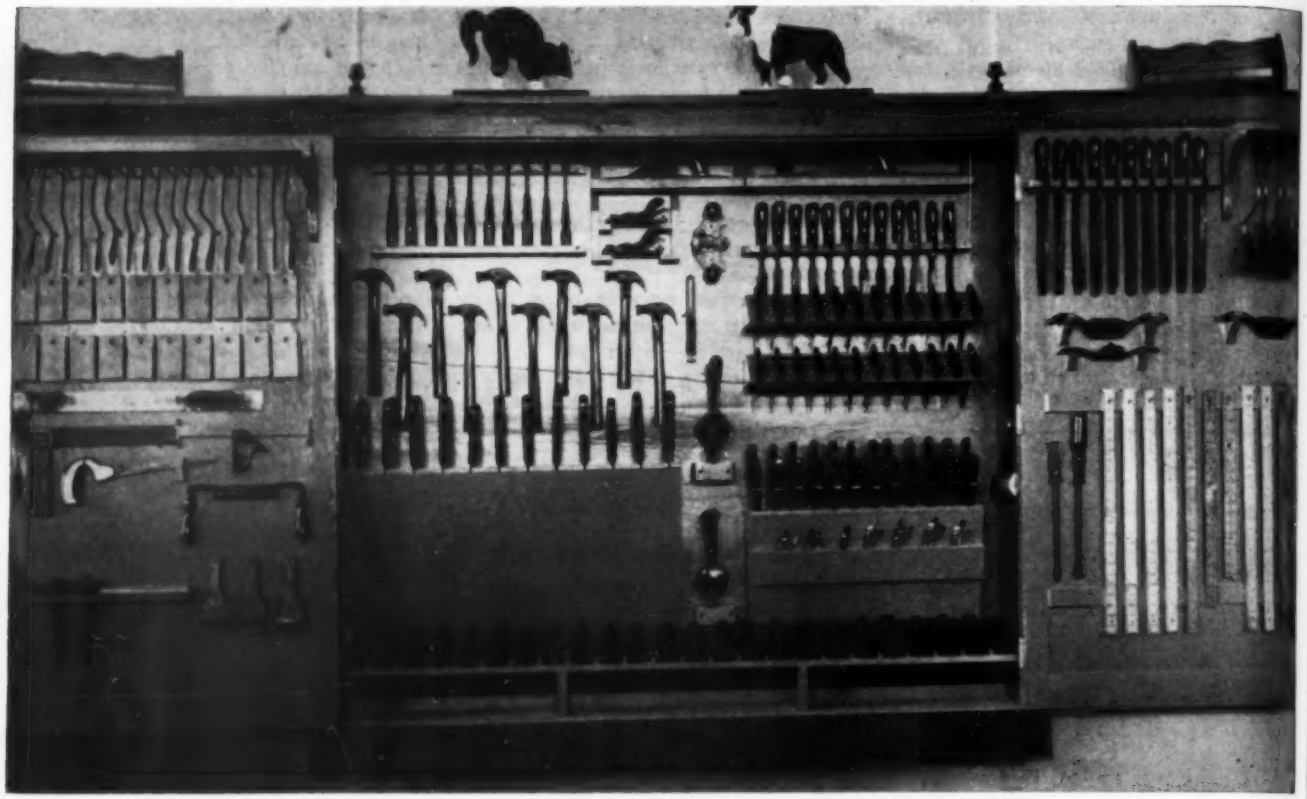
● - INDICATES NAIL OR BOLT TO HOLD TOOLS IN PLACE
J - INDICATES BENT NAIL - OR SQUARE SCREW HOOK



TOOL PANEL FOR ART METAL ●-INDICATES NAILS TO HOLD TOOLS IN PLACE ▲- " " BLOCKS " " " " "



TOOL PANEL FOR LEATHER ▯- INDICATES STRIPS OF LEATHER TO HOLD TOOLS IN PLACE



Tool cabinet designed by Clayton Carley, woodwork instructor at Kirby-Smith Junior High School, Jacksonville, Fla. Submitted by I. D. Henson, department head

A System of Vocational Classifications and Frequencies

ERNST H. SUERKEN
Supervising Principal
Union Free School District, Greenburgh Number Eleven
Dobbs Ferry, N. Y.

This system of vocational classification and frequencies groups a number of definite abilities and special scholastic subjects in separate classified divisions. These qualifications frequent a number of related vocations. The plan is to point out quickly those vocations that are related in their requirements.

First: Read the requisites of all divisions before making your final selection.

Second: Select only one of the divisions for your classification.

Third: The requisites of each division relate to a number of different vocations. In selecting your division, concentrate on that one which lists the greatest number of abilities and scholastic subjects that fit your definite qualifications.

Fourth: Having determined your division next review all vocational titles, listed under that division, and make a notation of only those in which you can probably qualify. These are the vocations which you should explore and for which you should analyze your qualifications.

Division A: Trained or graduated and having ability in the following, (highly technical and scientific): high scholastic grades in advanced mathematics, excellent mechanical ability, advanced mechanical drawing and designing, the ability to grade well in engineering sciences, mechanical legalities and architectural endeavors.

Architect	Electrical engineer
Patent attorney	Mechanical engineer
Air conditioning engineer	Mining engineer
	Radio engineer
Chemical engineer	Refrigeration engineer
Civil engineer	
Combustion engineer	Safety engineer
	Steam engineer

Division B: The training and ability to grade well in the following: money and finance, credit and collection problems, business statements and reports, foreign trade and exchange, analyzing and tabulating business transactions and records, accurate in figures and computations, ability

to compile and service statistics, marketing, merchandising, manufacturing (all industry), ability to contact and service the public efficiently.

Accountant	Banker
Auditor	Financial broker
Investment banker	Credit manager

Division C: Highly proficient in the following subjects: mechanical ability (machines, engines, mechanical devices), mechanical drawing and designing, machine tools (design and operation), mathematics (including algebra, geometry, trigonometry), mechanical assembly, industrial arts (mechanically skilled), mechanical (construction, erection and dismantlement), metals and their properties (chemical, physical, heat treating, etc.).

Draftsman	Master mechanic
Machinist	Toolmaker

Division D: Skilled or very efficient in the following (these requirements are directly related to manual labor): dexterity — deft fingers — speed — precision, design (mechanical) — electrical principles and operations, engine and motor mechanics — construction — sewing (hand or machine), patternmaking — mechanics — machine or instrument operation, military and war (equipment and corresponding operations). The foregoing requisites include male and female operators, craftsmen, tradesmen.

Airplane and engine mechanic
Auto mechanic
Cabinetmaker
Dressmaker
Electrician
Marine (U. S. Marine)
Mason, contractor (stone — brick)
Molder (foundry)
Patternmaker (Industrial foundry)
Plumber — steam fitter
Sailor (U. S. Navy)
Sheet-metal worker
Soldier (U. S. Army)
Surveyor
Telephone operator (Telephone company)
Telephone operator (industrial company)

Division E: Special training and ability to grade well in the following subjects: chemistry, metallurgy, smelting, fuels, refractories, shaping, fabricating and casting of metals, furnaces (design and operation — heating and melting types), all highly scientific.

Assayer (ores)	Metallurgist
Ceramist	Rolling-mill superintendent
Furnace superintendent	Metals
Heating and melting	

Division F: Highly trained and graduated in the following subjects: chemistry, bacteriology, assaying, physics, psychology, psychiatry, materia medica, physical sciences, human anatomy, medical subjects, physical and chemical laboratory (equipment and courses), microscopical determinations, surgery dietary. NOTE: Physicians, qualifying in this division, are legally permitted to administer drugs to others. All the foregoing requisites are highly scientific.

Bacteriologist	Psychiatrist
Industrial chemist	Surgeon M.D. (general)
Dentist	Veterinarian
Oculist	
Physician	

Division G: Specially trained and graduated in courses that include the following subjects: nursing the sick, materia medica, compounding drugs, surgery, physical culture, therapy, physical hygiene, muscular manipulation, bone adjustment, orthopedics, dietary, chiropody, chemistry, derma-surgery, physical sciences, contacting and serving the public professionally, ability to sell your own personal services. NOTE: Physicians, qualifying in this division, are not legally permitted to administer drugs to others.

Chiropodist	Optometrist
Funeral director (including embalmer)	Osteopathic physician
Nurse, trained (male — female)	Pharmacist (merchandising)
	Therapist

Division H: Highly trained or graduated in the following subjects: geology, minerology, astronomy, geography, mathematics, sciences, associated subjects, mechanics, physics, all highly scientific.

Astronomer	Geologist (general)
Geographer (general)	Minerologist

Division I: Thoroughly trained and graduated in the following subjects: High grades are required and relate to professions: teaching students — academic subjects, arts, crafts, and trades. All major academic subjects: philosophy, psychology, sociology, bible, government, problems of democracy, law (civil, criminal, corporation, etc.) ecclesiastical subjects and Canon Law.

Attorney-at-Law
Clergyman
Teacher: kindergarten, elementary, intermediate, rural, secondary, arts, special

Division J: Artistically trained and graduated preferably in special courses including the following subjects: artistry (drawing, painting, designing, drama, music, interior decorating, sculpturing, photography), writing, English, poetry, literature, histories (American, English, modern, world, medieval), technicalities of screen, stage, theater, teaching dramatics, costuming, modeling, illustrating, selling (self or wares), designing garments, vogues, grooming, contacting and serving the public efficiently.

Actor	Dramatic critic
Commercial artist	Interior director
Artist (fine arts)	Theatrical director
Illustrator	Photographer
Beauty specialist	Playwright
Theatrical costumer	Stage designer
	Theatrical manager

Stylist and proprietor (department store, women's specialty shops, millinery wearing apparel)

Division K: Trained and graduated preferably in special courses including the following subjects: chemistry, bacteriology, horticulture, agriculture, forestry, farming, tree surgery, fruit growing, plant pathology, animal breeding, dairy farming, stock raising, biology, botany, zoology, wild life, taxidermy, gardening, microscopical determinations, landscape architecture. Landscape architect preparing for park, cemetery, golf course, estate management or city forester. Landscape architect preparing for city planner.

Breeder (animals and birds)	Horticulturist
	Nursery man
Farmer	Plant pathologist
Florist (greenhouse)	Stock raiser
	Taxidermist
Florist (retail)	Tree expert (director)
Forester	
Fruit grower	

Division L: Specially trained and experienced in the following subjects: merchandising, marketing, buying, selling, financing, economics, manufacturing, business and financial reports, distributing, shipping, freight rates, personal problems, advertising, business and financial statistics, displaying and inventories.

Buyer (general)	Merchant (general)
Manufacturer (general)	Personnel director
	Purchasing agent

Division M: Trained or graduated in the following subjects: chemistry and bacteriology of foodstuffs, preparation and service of food, preservation of foodstuff, cookery, catering functions, dispensing beverages, table service and appointments, social etiquette, balanced food menus, dietary, rooming and serving guests (hostelry), general business management problems.

Brewer	Hotel manager
Cafeteria manager	Restaurant manager
Caterer	Tearoom manager and owner
Chef	

Division N: Specially trained or graduated preferably in courses including the following subjects: sociology, criminology, social welfare, home economics, psychology, child study, recreational activities, physical culture, athletic coaching, government, probation problems, legal investigations, sanitation, moral and ethical correction, state compensation and labor laws, human relations, translating in court, librarian activities, book reviewing, book reference, histories, literature, biographies, philosophy.

Book reviewer
Camp director
Home demonstrator
Detective
Children's librarian
Industrial librarian
Community librarian
Physical director
Recreational director
Social worker
Translator

Division O: Specially trained or graduated in courses including the following subjects: publishing, printing, engraving, lithographing, commercial art, cartooning, printing machinery, editing, advertising, selling, travel, collecting news, writing, adventure, English, histories, biographies, psychology, philosophy, propaganda, political subjects, business subjects, government, human relations, foreign customs.

Advertising director
Advertising director (newspaper)
Newspaper cartoonist
Newspaper editor
Photoengraver
Journalist
Printer (Compositor)
Printer (General)
Printer (pressman)
Printer (proofreader)
Printer (typographer)
Publicity manager (newspaper)
Publisher (newspaper)
Reporter (aspiring to become a correspondent or news commentator)
Writer (author, novelist)

Division P: Special training and schooling incident to acquiring a license to operate or direct the operation of a power driven conveyance: transportation (rules, schedules, regulations, signals), safety first and sanitation requirements, interstate commerce rules and regulations (legalities), mechanics, manual training, climatology, meteorology, astronomy, weather reports, mathematics, marine regulations, travel, foreign customs, adequate knowledge of and the highest regard for, the safety, convenience and comfort of others aboard the conveyance that you man or command.

Air line pilot
Bus driver
Mariner
Merchant marine officer

Division Q: Trained and schooled in the following subjects: selling (straight, retail, direct mail, telephone, directing advertising copy), contacting and serving the public (pleasantly, efficiently), public speaking, travel, foreign customs and practices, demonstrating, soliciting, collecting, advertising, transportation (schedules, modes, hardships, conveniences), office practices (typing, shorthand, bookkeeping, shipping, billing, invoicing, credits, computing machines, clerkship), character reading, report writing, publicity ability, adjusting claims, secretarial activities (business or social), commercial law, business promotion, real estate subjects, buying.

Auctioneer
Bookkeeper
Office clerk
Radio announcer
Realtor
Sales clerk
Salesman
Private secretary
Social secretary
Professional shopper (female)
Court stenographer
Public stenographer
Stenographer

Course of Study in Related Chemistry for Vocational Students

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PART I

Aims and Objectives

If the instruction is to be purposeful, worth while, and give the greatest measure of contribution to the student, aims and objectives must be established and developed. Training can then follow more smoothly to the desired goals. Determining aims, therefore, is the starting point in developing this course of study.

Aims and objectives are developed first in terms of the vocational department. From the department objectives merge the specific objectives of this course in related chemistry.

Vocational Department Aims

1. To develop a flexible vocational trade program which will fit the needs of every boy.
2. To maintain courses of study which will provide the basic skills necessary for the initial employment of youth in the trades or occupations vitally necessary to the community.
3. To broaden the program of studies to include related fields of study and the strictly academic subjects which are necessary for the development of a well-rounded individual.
4. To develop efficient work habits and a respect for safety and hygiene in performing his work, so as to safeguard his own and his fellow-workers' lives.
5. To develop ideals of honesty, courtesy, and co-operation, the ability to get along well with other persons, and the development of wholesome social and moral attitudes so essential for wholesome civic life.

Aims of Related Chemistry Course

1. To develop a skill in handling laboratory and scientific equipment.
2. To develop the ability to apply the scientific method of thinking to shop problems and problems of daily living.
3. To develop a simple understandable knowledge of the basic, fundamental principles of chemistry.
4. To develop a keener sense of observation in study and work.
5. To develop an appreciation of the opportunities available in vocations in which a knowledge of chemistry is essential.
6. To understand the close relationship between chemistry and industry.
7. To acquire a knowledge concerning the preparation, properties, and uses of certain chemicals essential to modern industry.
8. To acquire a knowledge of industrial materials and the chemistry related to these materials.

PART II

Organization and Management of the Class

The smoothness of operation of any course depends largely on the careful organization and management of the class. This particular part of the course of study aims to describe the plan for operation of this course in related chemistry.

Status of Pupils and Class Group

The course in related chemistry is given to vocational students in the eleventh grade. All pupils have had a course in general science in the ninth grade. Class groups are organized by combining two grade groups in one section so that the work can be more easily related to the specific grades. The enrollment in any one class ranges from 20 to 28 students.

Time Available

The school is organized on the all day unit trade basis. The school week consists of thirty periods divided into six periods each day. Fifty per cent of the 38 weeks in the school year is devoted to practical instruction in the shops and 50 per cent to the study of related and general education subjects. This division of time is accomplished by having boys alternate two full weeks in the shop and two weeks in the classroom subjects. During the weeks that a boy is in class a total of eight 50-minute periods are devoted to the study of related chemistry. Two of these periods are single periods and three double periods are available for laboratory work. A total of 152 periods or 7600 minutes are provided for this work.

Class Regulations

The following simple rules and precautions must be observed at all times:

1. Students shall not leave the room without permission from the instructor.
2. Students are assigned to a definite seat and work station for classes and laboratory work.
3. Each student shall be familiar with and follow the safety precautions as outlined on Information Sheet 7, Unit I.
4. Report all cases of accidents, no matter how small, to the instructor.
5. Following an absence from class, an admission or excuse blank must be presented to the instructor.

Controls Under Direction of the Instructor

The smoothness with which a class runs depends in a large measure on the degree of organization. Certain responsibilities are distinct responsibilities of students, however, and the instructor is responsible for the following regulations and controls.

1. Check class attendance at the beginning of each class period and record absentees in the roll book.
2. Keep class records and grades.
3. Maintain orderly class procedure.
4. Entrance to and dismissal from class.
5. Grant permission to boys who need to leave the classroom.
6. Order material, equipment, and supplies.
7. Read all announcements, which appear on the morning and afternoon bulletins, to the students.

Controls Under Direction of Students

Many of the characteristics of leadership, co-operation, honesty, etc., can be taught by delegating certain duties and obligations to the students. If these responsibilities are definitely formulated and explained to the class in detail, students will take pride in handling the jobs well. The following are such pupil responsibilities:

1. Comply with the few essential class regulations as outlined.
2. Clean and return all laboratory equipment to its proper storage place after completing an experiment.
3. Comply with all safety precautions as outlined in Unit I, Information Sheet No. 7.
4. Fill out all experiment reports neatly and completely.

Basic Texts and Reference Books

Chemistry of Our Times, Weaver and Foster
Chemistry in Modern Practice, Lemkin
Introduction to Industrial Chemistry, Frier and Holler

Supplementary Reference Books

A Lecture Course on Coated Abrasives, Behr-Manning Co.
Chemistry and You, Hopkins
Chemistry of Engineering Materials, Leighton
Coloring, Finishing, and Painting Wood, Newell
Consumers' Science, Hausrath and Harms
Dictionary of Metals and Their Alloys, Camm
Handbook of Chemistry and Physics, Hodgman
Light Metals and Stainless Steel, Commonwealth of Pa.

Methods Used in Teaching the Courses

Probably the most common method of instruction used is the discussion and question-answer type of teaching. In order to vary the method of teaching, problems are studied or written out on the assignment sheets. This is followed by class discussion of the problems and a brief examination.

Two types of instruction sheets have been developed as a teaching aid. The instruction sheets outline the informational content of the course in detail, while the exercise sheets outline the experiments to be performed. The experiments are performed by individual students or by a group of students working together. At times a student or group of students demonstrate an experiment to the class, while at other times, the instructor performs the demonstration. Information and exercise sheets are available in quantities so that each student has a copy for his notebook.

Special supplementary research problems and reports are assigned to individual members of the class periodically, and oral reports are presented to the class.

At about the end of the first semester plans and requirements for a final research project are outlined. This project must be an essay, a picture collection, an exhibit or a display of some scientific nature related to the trade the student expects to follow. In some cases a group of boys may work together on the project if approval is granted by the instructor. Tentative plans must be worked out for approval and a final oral report given to the class.

Field trips to local industry are made as they fit into the teaching program and throughout the year local industrial leaders are invited into the school to discuss certain problems with the boys.

Examinations, Grading, and Scoring

The grading system used for rating classwork and examinations employs a five letter scale as follows:

A — outstanding achievement or	95–100 per cent
B— above average or	87– 94 per cent
C— average or	76– 86 per cent
D — below average or	70– 75 per cent
E — failure or	below 70 per cent

Brief examinations are given at the end of each unit of work and at the end of a two-week class period. Special reports are graded and extra credit is granted for submitting supplementary reports that are not required. Heavy weight is given to the final research project.

If a student is failing at the end of four weeks of any nine-week period, the student is given a notification blank which is taken home for the parents' signature and returned to the instructor.

There is no regular midterm examination and all students must take the final examination at the close of the school term.

The final grade is determined by averaging the four regular grading period marks plus double the final examination. These six grades must average to 1.0 in order to receive credit for the course.

OUTLINE OF COURSE IN RELATED CHEMISTRY

UNIT I — Introduction

Information sheets: (1) History of Chemistry. (2) What Is Chemistry? (3) Why Study Chemistry? (4) Chemistry and Industry. (5) The Scientific Method. (6) Use of Laboratory Equipment. (7) Laboratory Safety Precautions.

Exercise Sheets: (1) The Bunsen Burner. (2) Common Laboratory Equipment. (3) Applying Heat to Glassware.

UNIT II — Laws of Matter

Information Sheets: (1) Atomic Structure of Matter. (2) Elements. (3) Compounds and Mixtures. (4) Physical and Chemical Changes. (5) Energy Changes. (6) Solutions, Colloids, and Suspensions. (7) Acids, Bases, and Salts.

Exercise Sheets: (1) Compounds and Mixtures. (2) Physical and Chemical Changes. (3) Factors Affecting Solubility.

UNIT III — Chemical Shorthand

Information Sheets: (1) Symbols, Formulas, and Valence. (2) Equations. (3) Chemical Calculations.

Exercise Sheets: (1) Symbols, Formulas, and Valence. (2) Equations. (3) Chemical Calculations.

UNIT IV — Oxygen, Hydrogen, and Water

Information Sheets: (1) Oxygen — Its Nature and Uses. (2) Oxidation — Slow and Rapid. (3) Rusting and Corrosion. (4) Hydrogen — Its Nature and Uses. (5) Water — Its Industrial Uses.

Exercise Sheets: (1) Oxygen — Its Preparation and Properties. (2) Rapid and Slow Oxidation. (3) Oxygen and Combustion. (4) Hydrogen — Its Preparation and Properties. (5) *Electrolysis of Water.

UNIT V — Metals

Information Sheets: (1) Iron. (2) Alloying Iron. (3) Types of Steel. (4) Production of Steel. (5) Aluminum. (6) Magnesium and Calcium. (7) Copper. (8) Tin. (9) Lead. (10) Zinc. (11) Gold, Silver, Platinum. (12) Miscellaneous Metals.

Exercise Sheets: (1) Properties of Iron and Steel. (2) Properties of Aluminum. (3) Properties of Magnesium and Calcium. (4) Properties of Copper and Its Alloys. (5) Properties of Zinc, Tin, and Lead. (6) *Tests for Iron, Aluminum, Magnesium, and Copper. (7) *Tests for Zinc, Tin, Lead, and Calcium.

UNIT VI — Building Materials

Information Sheets: (1) Manufacture and Properties of Glass. (2) Composition and Use of Glass. (3) Types of Glass. (4) Glass Products. (5) Properties and Processing of Clay. (6) Refractories. (7) Cement and Mortar. (8) Lime and Gypsum Products. (9) Organic Protective Agents. (10) Inorganic Nonmetallic Protective Agents. (11) Metallic Protectors. (12) Wood and Wood Products. (13) Insulating Materials.

Exercise Sheets: (1) Glass Manipulation and Making. (2) Ceramics. (3) Cement and Plaster. (4) Paint and Paint Products. (5) Distillation of Wood. (6) Electroplating Copper.

UNIT VII — Fuels

Information Sheets: (1) Carbon and Its Compounds; (2) Coal and Coke; (3) Petroleum. (4) Alcohols. (5) Gases — Natural, Coal, Water, Acetylene.

Exercise Sheets: (1) Distillation of Coal. (2) Formation of Acetylene Gas. (3) Properties of Alcohol and Fermentation of Alcohol. (4) Carbon Dioxide.

UNIT VIII — Miscellaneous Materials and Processes of Industry

Information Sheets: (1) History of Abrasives. (2) Bonds Used in Production of Abrasives. (3) Abrasive Grains. (4) Abrasive Properties and Backings. (5) Steel Wool. (6) History of Adhesives. (7) Glue. (8) Miscellaneous Adhesives. (9) Inks and Dyes. (10) Paper Manufacturing. (11) Plastics. (12) Rubber. (13) Refrigerants. (14) Welding Processes.

Exercise Sheets: (1) Inks. (2) Papermaking. (3) Making and Manipulating Plastics. (4) Properties of Common Abrasives. (5) Properties of Common Adhesives. (6) Dyes and the Use of Mordants.

UNIT IX — Vocations Related to Chemistry

Information Sheets: (1) Job Success Factors. (2) Jobs in Industrial Chemistry. (3) Other Industries Requiring a Knowledge of Chemistry.

Exercise Sheets: (1) Research in an Interesting Vocation in Industrial Chemistry. (2) My Success in Industry Depends on *Me!* (An essay.)

*Teacher demonstration.

Consumer Education in the Industrial Arts

ROD HOBSON

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Remember the students who say, "What good is that?" or "Why do we have to learn this?" Statements such as these show an unawareness of the relationship between school offerings and life's applications of them.

And truly, many school subjects have not yet been made really functional. Whether it is always desirable to make them functional, is not under discussion here. However, when students see immediate use for what is being taught, they are much more receptive to direction.

We know so little about what path our students may elect for their future journeys, that we give them a broad training which is assumed to prepare them for a wide variety of possibilities. However, it takes but little speculation to be certain that they are, and will be, consumers of the goods and services in the world about them.

This contact is nothing new, for they have been consumers most of their lives, but in most cases this activity has been unguided. This situation is common; yet it receives little emphasis in formal education. And herein lies a challenge and opportunity for the teacher of industrial arts, especially at the junior high school level where our courses are becoming increasingly exploratory and informative.

Possibly one reason why advancement has not been more rapid for the consumer movement in our field, is that we instructors have not been fully aware of the presence of the problem as it relates to industrial arts. Some mention of it is found in listings of our objectives, but consumer education is still thought by many to be "instructive in buying." This is only a small part of the picture.

To give youth the background they need for life in our modern world, we must instill an *attitude* which enables the student to honestly contribute to the improvement of his plane of living, and to that of the community. There is quite striking similarity between our objectives in industrial arts and the following five now widely accepted for consumer education.

1. *Wise choice.* Energy and money should be used to best suit the need of the individual. Training should show the student how to select his strongest desires and needs, and satisfy both.

2. *Wise buying*. This represents the popular connotation of consumer education. After choice making, the problem becomes one of selecting an item from the many available.

3. *Social responsibility as a consumer*. This concept links the consumer action to its effect on society. The recent war with its rationing and substituting of goods, and the going without entirely, illustrates many examples of the consumer-society relationship.

4. *Intelligent use of consumer goods*. Obviously the longer an item will serve our needs, the more our resources may be devoted elsewhere to raise the standard of living.

5. *Competent money management*. Modern living makes requisite the ability to count change, keep simple records, handle bank accounts, and plan for the future.

The industrial-arts instructor will read the foregoing and conclude that consumer information has been taught in his shop for years! For are not these objectives reflected in our emphasis on planned use and conservation of materials? In the computing of the bill of materials? In the selection of the material for the project? In the identification of good workmanship and construction? Are not our students better able to select the services of the electrician, carpenter, plumber, and other maintenance and utility services because of the contact with similar work in our shops?

At this point let us lean back, thumbs in vest, and beam proudly upon a job well done! But let us pause briefly. Has this training actually carried over to the post-school life of our students? None of us would look far before we would find cases where the carryover has been negligible.

By presenting our course material with a slant toward its effect on every day, out in the world life, an *attitude* will be generated which will burrow to the roots of thinking.

The industrial-arts instructor is in a position to emphasize many consumer topics more forcefully, more logically, more functionally, than any other member of the school staff. Except in extreme cases, he is at liberty to choose his method of approach to a given subject, even though the state and local administrations dictate what subject areas are to be included in the curriculum. More than in most courses, the industrial arts offer actual practice in buying, using, transforming shape, and otherwise becoming acquainted with a variety of consumer materials and services. It should be, then, a part of the individual instructor's philosophy to include as much information as possible which has practical application at present and in the future for all students.

Enlarging an already bulging course of study is not being advocated. The consumer *attitude* can be brought into nearly every existing lesson now taught in the industrial arts. The problem is not one of revision, but rather of presentation. Consumer *topics* should not be *forced* into a course, but the consumer *attitude* may be developed by using that approach to the subject matter in which it is logically embodied.

There follows a sample list of industrial-arts objectives in which the consumer attitudes and information can easily, logically, and necessarily be included.

1. Know how to recognize good workmanship and what it means to a consumer.

2. Know the general work involved in a product so as to better appreciate its value.

3. Know the uses of industrial materials, their ease of handling, their relative cost, and where and how to buy them.

4. Know how to select the best material from the several available for the same use.

5. Know how to recognize repairable damage from that which would be too expensive to attempt.

6. Know the value of conservation of materials and energy by careful planning.

7. Know how to use and care for equipment properly, and why this makes a better consumer-citizen.

8. Know the scope of consumer services which are related to shop subjects (i.e., services rendered by the architect, welder, blacksmith, carpenter, plumber, electrician, etc.).

Let us consider one example in detail.

The trend in drawing for grades 7, 8, and 9 is away from the inking of plates, split hair accuracy, and conformance to minute details in plate layout. Our concept today gives the student a wider range of experience which imparts more information and somewhat less *professional* skill.

Thus we conceivably find our students drawing a floor plan of a house, but only in pencil. They are the *architects*. The instructor may invite a professional architect in as a consultant for the students. They learn what services the architect performs and why these services are worth his fee. Perhaps the problems of lot selection, taxes, neighborhood, proximity to public transportation, schools, churches, and business districts are discussed, but only briefly. There may be time to draw a map of the neighborhood in which their *ideal houses* should be built.

They will learn simple cube estimating so that they can very roughly arrive at the cost of their *houses* and those their parents see in current home planning magazines. They have acquired a bit of knowledge, which is immediately applicable in a housing conscious world.

As interest in the project crescendos, they will become concerned about materials of industry, learn the drafting symbols for them, and learn something about the application and cost of these materials in their *houses*. They may discuss insulation and the subsequent saving in fuel. If presented simply, this is not above the junior high school level.

The local electrician may be persuaded to explain his job, both in construction of new buildings and in repair and remodeling of standing structures. He should mention how he uses drawings in his work, thus placing a dollars and cents value on the knowledge of drawing and blueprint reading.

The plumber, carpenter, and mason fit similarly into the picture. The students will be better able to deal with these men and their services in the future.

There are those who are at this point willing to defend teaching straight drawing, for after all, that is the requirement of the curriculum. They will say that skills and technical information come first and that there is no time left for anything else. This may admittedly be true, but in the junior high school, the line marking the *necessary* skills and technical information is drawn too far down in the area of minute detail. All but the *fundamental* skills and technical information may well be postponed until the student enters the senior high school or vocational school where it is given as actual preparation for a particular job.

The industrial arts shall always remain largely manipulative, but more information of a general nature must be offered if the junior high school industrial arts is to fulfill successfully its guidance and general education functions.

The preceding discussion shows how to provide basic drafting skills with its related information, so that it will serve as motivation for the more important (at the junior high school level) general information.

That this general information should contain consumer information is of vital importance. The possibilities are limited only by the imagination of the instructor, and the actual achievement by the time available. The outcome will be that the students will have received training which they will use now, and for the rest of their lives!

DEFINITION:- *A patternmaker is a craftsman who makes wood and metal patterns which are used for the reproduction of castings of any type metal.*

TRAINING PROGRAM

ON-THE-JOB WORK PROCESSES

Varnishing, sanding and finishing patterns and small wood turning.
Working with patternmaker on large patterns
Making small patterns

Making large patterns: wood, metal, plaster.
Foundry molding — coremaking
Machine shop
Pattern checking

RELATED TECHNICAL UNITS
Classroom instruction

APPRENTICE & HIS TRADE:-
Scope of the trade

SAFETY PROBLEMS:-
To self - To others -
To stock - To equipment

TRADE TERMINOLOGY

TRADE MATHEMATICS:-
Fundamentals of arithmetic
Mensuration
Applied geometry

MECHANICAL DRAWING:-
Introduction and instruments
Drawing problems
Geometrical construction

SHOP SKETCHING:-
Principles of projection
Sketching practice

BLUEPRINT READING:-
Symbols, Line indications
Plan views, Elevations, Sections, Details

LAYOUT:-
Wood patterns
Metal patterns

FOUNDRY PRACTICES:-
Snap molding *Coremaking*
Floor molding *Core setting*
Check molding *Facing*

PATTERN PROBLEMS:-
How to mold
Core-print support
Layout mathematics

PATTERN CONSTRUCTION:-
Segments or Staves
Core-print construction
Fabrication of pattern

BASIC EMPLOYMENT INFORMATION:-
Health and safety
Laws that affect workers
Employee-Employer relationships
Employment opportunities
Personality characteristics

MANIPULATIVE UNITS

HAND-TOOL SHARPENING

MAKING SIMPLE PATTERNS

NOTE
"Metal" apprentices work in machine shop for metal-pattern practice
"Wood" apprentices work in pattern shop for wood-pattern practice.

ACKNOWLEDGEMENTS

ABOVE OUTLINE DEVELOPED AND APPROVED BY:- *Los Angeles Pattermakers Joint Apprenticeship Committee:- John C. Deise - H. A. Bierley H. A. Burrows — Fred T. Brinkman — Lester I Genz* Oct. 18, 1948 *R. O. Holmes — Chester A. Peterson - Edgar M. Wiethop*

CONSULTANT:- *Harry Simonds Coordinator, Metal Trades Apprentice Education, L.A. City Schools*

CHART PREPARED BY:- *J. Douglas Wilson Curriculum Consultant, Voc & Practical Arts Branch, Curriculum Division Los Angeles City Schools 1948*

DEFINITION:-
A wood and metal finisher is a craftsman who applies various kinds of paint, stain, filler, varnish, and lacquers by brush or spray-gun, sanding, rubbing and polishing to produce a smooth finished surface with specific decorative effect

TRAINING PROGRAM

ON-THE-JOB WORK PROCESSES

PREPARING SURFACES, *Old & new*
STAINING AND BLEACHING
FILLING

BRUSHWORK AND RUBBING
MIXING AND MATCHING COLORS
SPRAY WORK

RELATED INSTRUCTION UNITS
Classroom instruction

APPRENTICE & HIS TRADE:-
Meaning of apprenticeship
Guilds — Modern plan

SAFETY PROBLEMS:-
To self — To others —
To stock — To equipment

GENERAL SHOP INFORMATION:-
Tools and equipment
Shop rules and regulations
Correct job procedure
Shop efficiency
Job records

TRADE TERMINOLOGY

FUNDAMENTALS OF ARITHMETIC:-
Addition, subtraction, multiplication & division of:- whole numbers, decimals & fractions

TRADE SCIENCE:-
Materials:- Pigments & Liquids
Chemistry:- Colors-in-oil, synthetics: formulas
Color theory:- Theory, Harmony, Psychology

PROCESSES:-
Bleaching
Preparing & sanding
Staining
Filling
Putlying
Enameling
Glazing
Shellacking
Varnishing
Lacquering
Painting

PRINCIPLES OF SPRAY-GUN OPERATION

COLOR MIXING & MATCHING:-
Analysis and use of basic colors
Analysis and use of earth colors
Theory and practice of pigment mixing

MATERIAL LISTING:-
Liquid measurements & weights of paints, oils, etc.
Estimating correct amount of materials

BASIC EMPLOYMENT INFORMATION:-
Personality characteristics
Job relationships
Laws that affect workers
Health and safety
Employer and employee organizations
Employment opportunities

MANIPULATIVE UNITS
In school shop

STRIPING
STENCILING
HIGHLIGHTING
SPRAY-GUN OPERATION
BURNING IN
ANTIQUE WORK
LEAF WORK
GRAINING AND MARBLING

ACKNOWLEDGEMENTS

ABOVE OUTLINE DEVELOPED BY:- *Claymon Doele, Harvig R. Christensen, C.C. Collins, A.O. Fineland, Otto Rawwolf, Ralph Rivas, Carl Stegner, Leonard Yarra*

APPROVED BY:- *Los Angeles County Wood and Metal Finisher Joint Apprenticeship Committee Oct 25, 1948 Earl Johnson, App Education Coordinator, L.A. City Sch.*

CHART PREPARED BY:- *J. Douglas Wilson, Curriculum Consultant, Voc. & Practical Arts Branch, Curriculum Division, Los Angeles City Schools 1948*

Training program for apprentices of patternmaking and wood and metal finishing submitted by J. Douglas Wilson, curriculum consultant,

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Driver Education

H. W. HUMPHREY
Assistant Professor of Industrial Arts
Ohio University
Athens, Ohio

In a certain small high school in Southeastern Ohio students taking typewriting are required to spend approximately 180 hours to complete the course. Nearly all graduates take the course because of the limited curriculum. In this same school many hours are given to dramatics, music, Latin, and the various interscholastic sports. This is a situation which is typical of most schools regardless of size.

These same students learn to handle a 90 horsepower, one and a half ton vehicle by the most haphazard methods imaginable. Often the learning is accomplished in a school chum's jalopy, with no learner's permit and without the parent's knowledge. The teen-age boy teaches his teen-age girl to drive his father's car, thus endangering both their lives as well as those of other motorists and pedestrians.

Often teen agers are given expert (?) instruction by the father. This course of lessons usually consists of getting the learner behind the wheel and instruction is given in starting, shifting gears, driving back and forth in the driveway, then around the block in the residential district, followed perhaps by a trip through the business district. If he gets through these various phases successfully he is ready for his driver's examination and in most states it is difficult to fail this test. When the son passes this final hurdle the father brags to his friends at the office, "Well, Junior can drive as good as I can." Quite frequently this is no compliment.

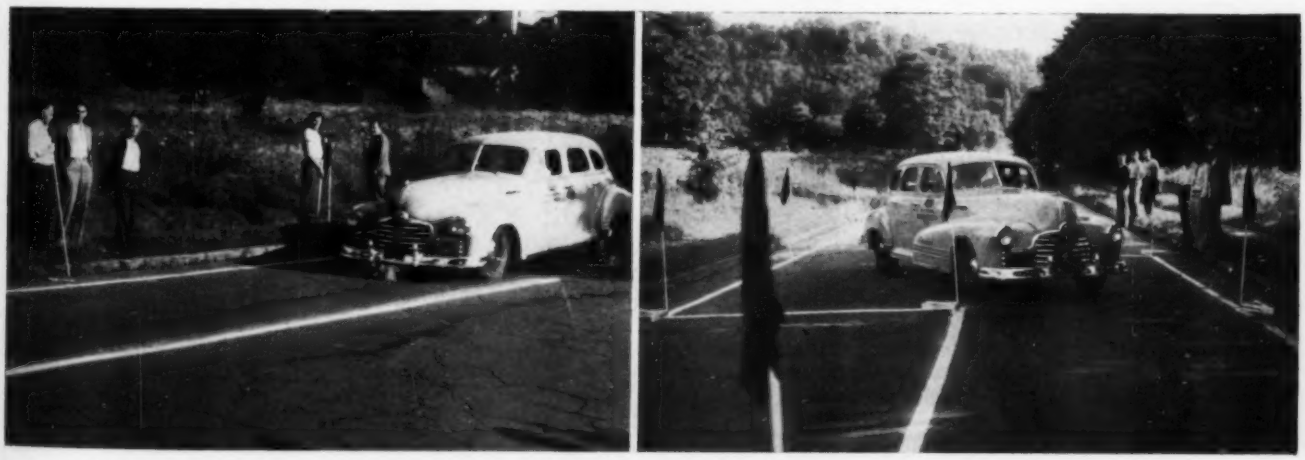
The subjects named in the first paragraph, typing, music, dramatics, and Latin, are important but how many times in the student's future will a knowledge of these subjects mean the difference between life and death. If a portion of the time consumed by one of these subjects were devoted to the teaching of properly driving a car, it would certainly help decrease the carnage on our highways. High school students who have 100 per cent of their driving careers ahead of them, should be taught to drive by qualified teachers, in cars adequately equipped so that a learner is not a hazard to others while learning. He should be taught the mechanical limitations of a car. He should know the danger zone which extends ahead of the car, varying with road conditions, weather, mechanical condition of the car, and the condition of the driver.

Students measuring braking distance, car traveling at 25 m.p.h.

The finest brakes, the stanchest bodies, the heaviest bumpers, the best steering gear, the most perfectly engineered highways, and adequately staffed highway patrols will go a long way in helping prevent accidents, but until we give a more careful and systematic training to the young people who are learning to drive, we are still going to have a tremendous accident toll. Driving at a safe speed, obeying all traffic signs and signals, giving proper signals of your intentions, watching the other fellow, being on the alert at all times, all these should be automatic and instinctive and would be if the driver learned the proper habits and attitudes from the beginning.

In the recent World War there were 1,070,000 persons of the United States Forces killed, wounded, or reported missing in action. During these same war months 3,300,000 civilians lost their lives or were injured in traffic accidents here in the United States. In addition to the suffering, traffic accidents cause an annual economic loss that has been estimated to be two and one-half billion dollars. This is more than the annual operating cost of our public school system.

Driver education is a new subject in the high school curriculum, having been introduced in 1933 by Prof. Amos Neyhart



(Left) Car coming to a quick stop. Smoke at front bumper is from the detonator making a mark on the pavement and measures the driver's reaction time. (Right) Car being driven in close quarters. To pass the test it must be driven forward and backward within a given time without knocking over any of the flags

Training program for apprentices of patternmaking and wood and metal finishing submitted by J. Douglas Wilson, curriculum consultant.
CONSULTANT—Harry Sanders, Coordinator, Metal Trades Apprentice Education, L.A. City Schools

in the State College High School in Pennsylvania. During the 15 years that have elapsed since that time much has been accomplished, much interest has been manifested by various individuals and groups but very little has been done by the way of actual introduction of driver education courses into our schools. Approximately 2 per cent of our total number of high schools now have courses training high school students to drive.

There have been some studies made regarding the number of accidents in which graduates of a driver course are involved as compared to a similar group who had not taken such a training course. The Cleveland study showed that the trained group was involved in about half the number of accidents as that of the untrained group.

An analysis of the traffic accident picture reveals that 25-year-olds drive on the average of 12 million miles per fatal accident, and that 45-to 50-year-olds drive an average of 22 million miles per fatal accident, while the 16-year-olds drive an average of only two million miles per fatal accident.

The National Safety Council predicted 275 highway deaths over the July 4 week end in 1947. In *Time* magazine dated July 14, 1947, this sentence appeared: "Americans were back at work and the nation counted 553 holiday dead, 271 killed on the highways."

Statistics similar to those in the preceding paragraphs have been repeatedly published and yet those responsible for the operation of our public high schools (administrators, school boards, and the general public) have been content to stand idly by while the accident rate has steadily climbed. When enough people are convinced that the fight against traffic accidents is worth winning then, and only then, will we be able to put forth enough money and effort to win that fight. When parents assume the same attitude about teaching their sons and daughters to drive as they do about teaching them science, mathematics, history, and other academic subjects, then we shall be able to establish a real program of *driver education.*

The excuse administrators have had in the past, that of being unable to secure qualified instructors of driver education, will soon be a feeble one. Universities all over the United States are establishing classes to train high school teachers and the American Automobile Association is sponsoring intensive training courses for high school teachers and for members of college faculties. The problem of obtaining a car has now, in reality, ceased to exist. Any school, regardless of size, may now have the use of a dual controlled car provided they meet certain minimum standards which are:

Students measuring driver's ability to stop car smoothly at a given point

1. Provide a properly trained teacher to conduct the course.
2. Meet state education department standards for such a course, or, if none, the standards set forth in the *AAA* Teacher's Manual.
3. Use the car a minimum of 10 periods per week.
4. Submit a satisfactory application to the American Automobile Association covering such matters as insurance and car maintenance.

These young people are going to learn to drive and it is our responsibility as teachers and parents to see that they get the kind of training that will enable them to become good drivers and ultimately reduce our traffic toll.

The approach to this problem is said to be through the three E's, education, engineering, and enforcement. The automobile engineers have done a good job in constructing cars which are mechanically safe. The highway engineers are building better and safer roads. The enforcement of traffic laws is being accomplished more efficiently. Education is our problem and we have just begun to give it a place in our curricula in a few scattered areas all over the United States. Where it has been taught it has paid huge dividends. In many schools where driver education has been introduced the course is being handled by industrial-arts men. What group teaches this subject is not important. The important thing is that we as a nation accept the challenge of this cause and help our high school students to live.

The picture of the school chest gift of students of Tucson, Ariz., Senior High School, was taken by Mary Pfrimmer. Submitted by Harry A. Goldstein, instructor of photography

Problems and Projects

LATHE FIXTURE

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Department of Industrial Arts
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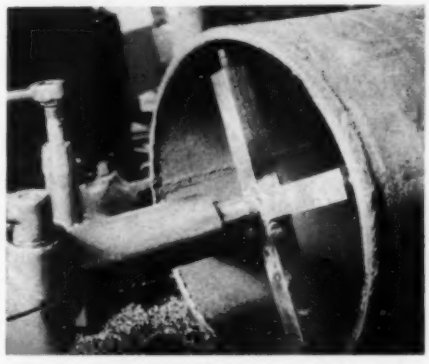
Santa Barbara, Calif.

Have you ever been confronted with the problem of machining a piece of tubing too large and too long to be chucked in your school shop lathe? If you haven't had this experience, this or a similar one may sometime be posted. An administrator may request help on a maintenance job; the janitor may request the machining of a job which you might better do, anticipating the time you may request help from him; or a boy with special ability and insight may need help on a special project.

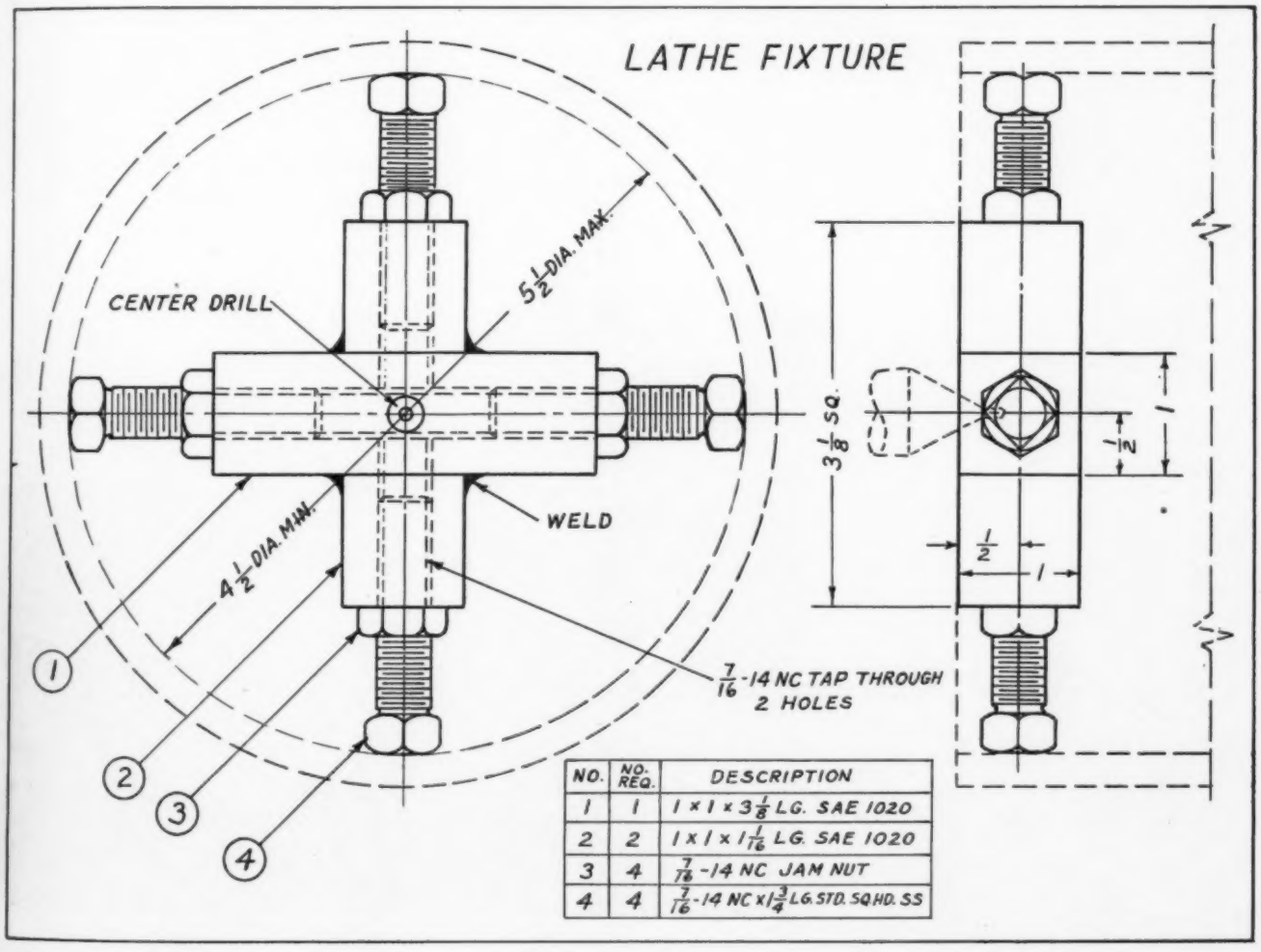


The lathe fixture mounted in the lathe

Knowing that necessity is the mother of invention, and also knowing that most shop teachers are ingenious, sufficient to most occasions, this information may not be necessary. However, a one minute introduction such as set forth here may save time on trial and error attempts at solving future problems.

The detail drawing in Figure 1 is self-explanatory. It is apparent that the fixture described, will accommodate a range in size of tubing from 4½ to 5½ in. I.D. The stock material, both steel and setscrews, need not be those specified, but could be any size or kind available sufficiently strong to do the job. It is also apparent that any size fixture might be constructed to meet specific needs. The picture is proof of the workability of this fixture.

December burn deaths usually top 1000. In the summer they average 500 or less a month. — *National Safety Council*



NO.	NO. REQ.	DESCRIPTION
1	1	1 × 1 × 3 1/8 LG. SAE 1020
2	2	1 × 1 × 1 1/16 LG. SAE 1020
3	4	7/16 -14 NC JAM NUT
4	4	7/16 -14 NC × 1 3/4 LG. STD. SQ. HD. SS

Fig. 1. Lathe fixture

WROUGHT IRON END TABLE

C. R. SUTFIN

West Side Union High School

Los Banos, Calif.

The leg design for the end table shown in Figure 1, breaks away from the usual method of making all four legs alike. This type of construction also is suitable for 3-pot ferneries or for the leg construction of other furniture.

As both wood and metal are combined in the structure of this end table, it is an ideal project for the teaching of learning units in the general shop and the student has something when he has finished. The joints may be either bolted, riveted, or welded, or a combination of all three which brings the project to the level of the junior or senior high school student.

For its construction a full-size drawing of the end view, shown in Figure 2, is necessary. Cut the iron to length and bend and scroll the pieces to fit the full-size drawing. Check them carefully to see that they line up, and that they do not have any partial twists in them. To keep the pieces Nos. 4 and 5 straight when twisting, place a piece of ¾-in. pipe of the same length as the twist over the metal between vise and wrench until the right number of twists have been made.

Fig. 1. Wrought iron end table

BILL OF MATERIALS

No. Req'd.	Part No.	Name	Material	Size
2	1	Back leg	Band iron	3/16 x ¾ x 66
2	2	Foot brace	Band iron	⅛ x ¾ x 11
2	3	Brace leg	Band iron	3/16 x ¾ x 49
2	4	Support	Band iron	⅛ x ¾ x 19
1	5	Back stretcher	Band iron	⅛ x ¾ x 20½
2	6	Front stretcher	Band iron	⅛ x ¾ x 21
1	7	Ring	Band iron	1/16 x ¾ x 8
2	8	Leaves	Sheet metal	18-ga. x 2 x 6
1	9	Top	Wood (walnut)	1 x 12½ x 23

Rivet holes are then made and the two end sections fastened together separately, then joined together with the front and back stretcher bars. In place of the ring here used between the two front stretchers, the student should be asked to design his own original ornament. Ornamental leaves are riveted on the large scroll and screw holes made into the upper part of the back leg to receive the top. As but two board feet of lumber are

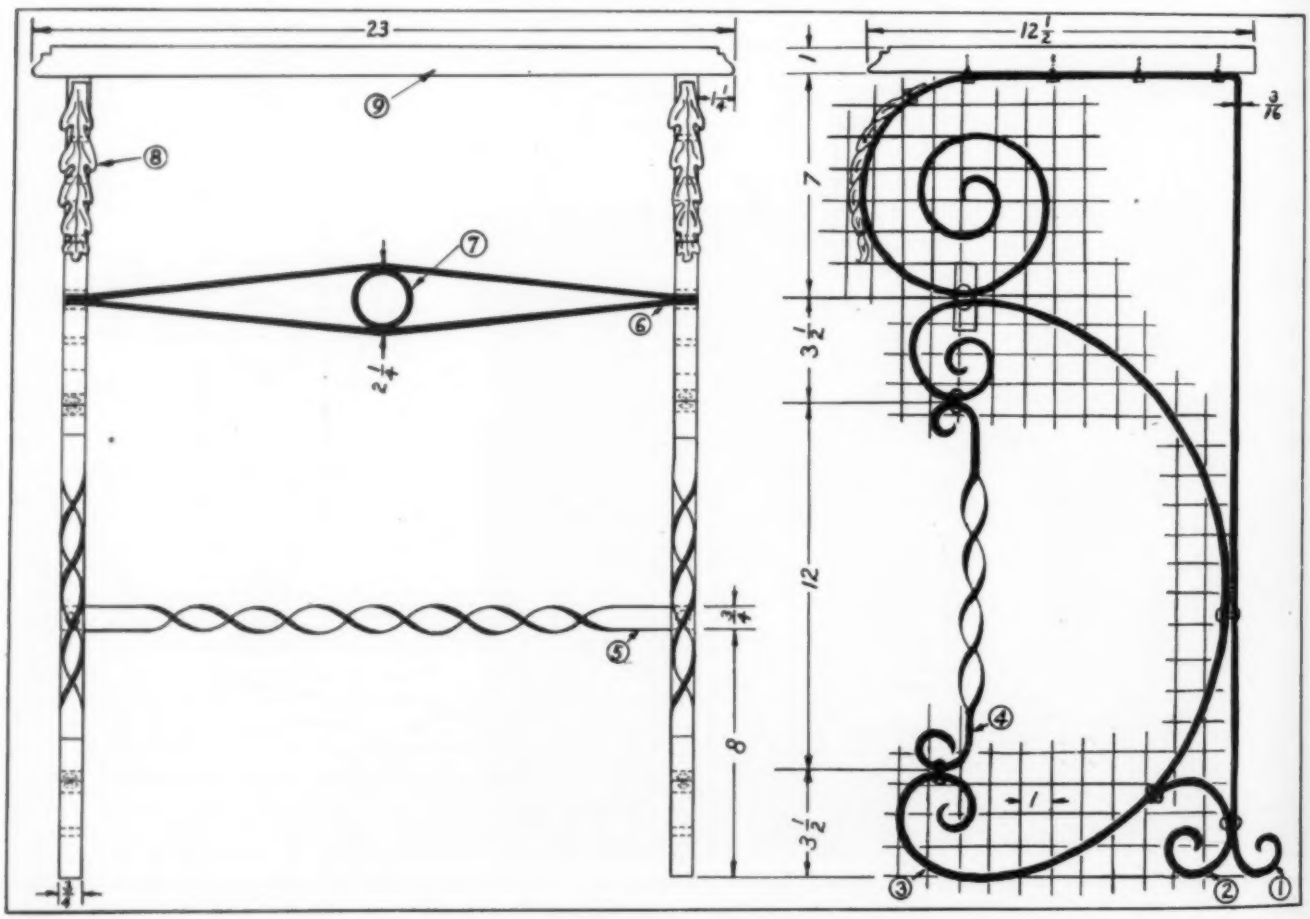


Fig. 2. Details of wrought iron end table

used for the top, walnut or other hard wood should be used.

A good finish for the iron is to give it a coat of black lacquer and then gold bronze the leaves, twists, and the upper part of all scrolls. If a hammered finish is desired the iron must be peened, blackened, and high surfaces polished with emery cloth to a steel gray, after which a coat of clear lacquer should be applied before the bending is done, as the moisture of the hands will produce rust on the bright surfaces. Another coat of clear lacquer should be applied after the article has been completed.

INDIAN SILVERSMITHING

BEN HUNT

Hales Corners, Wis.

(Continued from page 69 of the February, 1950, issue)

Bracelets

Although the article on Indian silversmithing in the February issue was to have been the last of the series, the author felt that the beauty of the bracelets described and illustrated herewith justified publication.

Some traders and some of the national parks will not accept Indian jewelry that has been made of sheet silver. They prefer to buy articles made of silver that has been hammered out. On the reservations, away from cities and before rolling mills were so universally available, all silver was melted, cast into ingots and then hammered out to the proportions and sizes needed for the particular piece to be made. It is, of course, a lot more work than using sheet silver but the results are much more gratifying.

The molds can be cut out of a brick, or made of plaster of Paris, or of graphite, or of any other material that will withstand heat. For the bracelet shown in the upper part of Plate 43, the ingot was about ¼ by ½ by 3 in. The mold was heated and the silver was poured into it until it was level with the top. Care must be taken to keep the silver from getting too hard when hammering out the ingot. To anneal silver heat the piece to a red heat, and when it blackens, grasp the ingot at one end with a common pliers that has serrated jaws, and hammer the flat side, changing ends from time to time until the piece is hammered out evenly. Then hammer the edges, setting it on edge on the anvil. Do not hammer silver too long, as it becomes hard and brittle rather quickly and will fracture or crack. To prevent this, anneal the silver frequently. It will seem slow work at first, but gradually the piece will lengthen and spread. Use a fairly heavy hammer. Pounding on the edges will lengthen it quickly and at the same time tend to keep it even along the full length. By the time you have it drawn to a full 6 in. it will be approximately ⅛ in. thick, or less. Now with a rather coarse file, work it down to an even surface with nice edges. Take out all the hammer marks. Anneal it again and mark it for the lining. Use a scriber and scratch it fairly deep. These

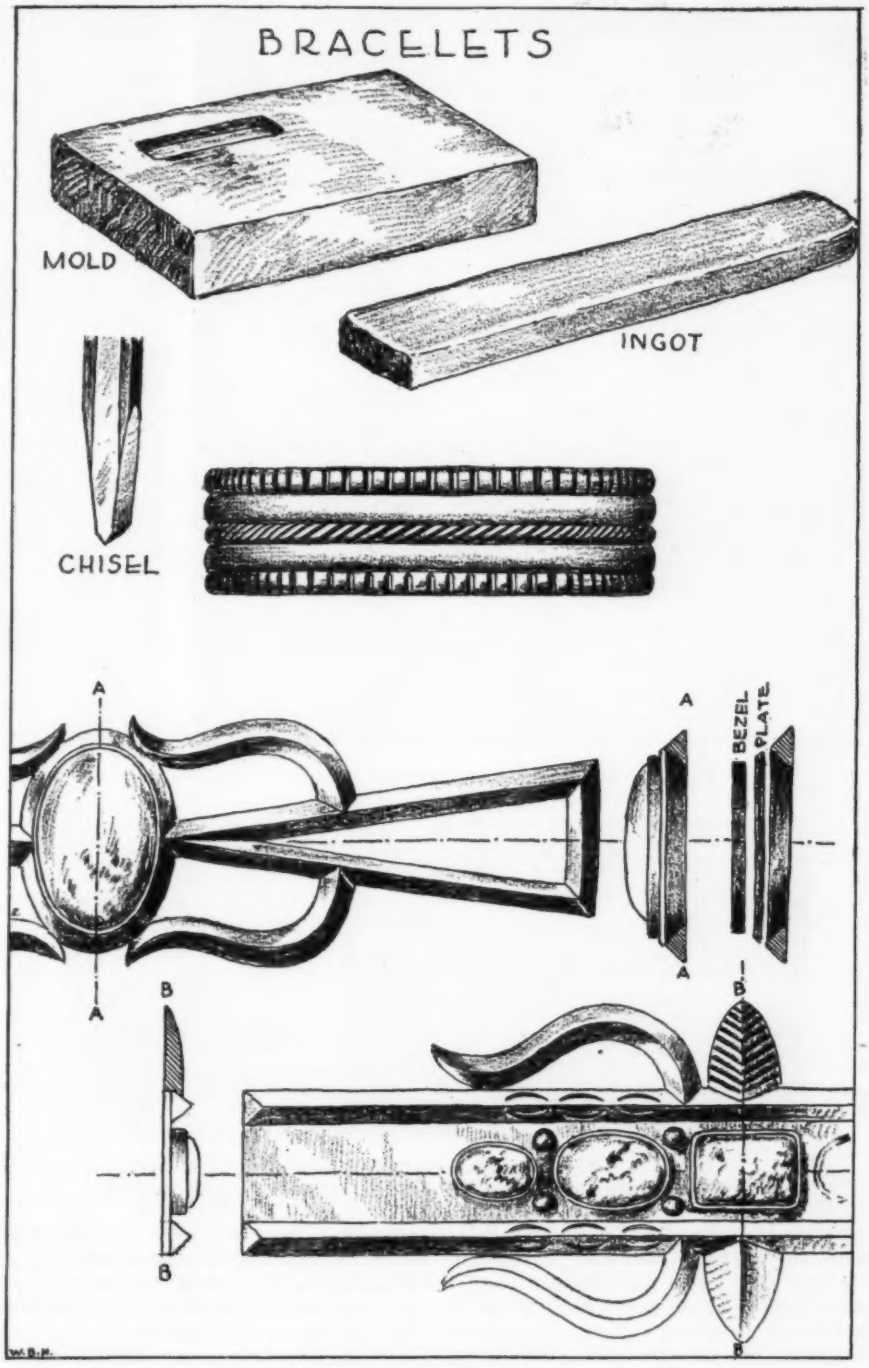
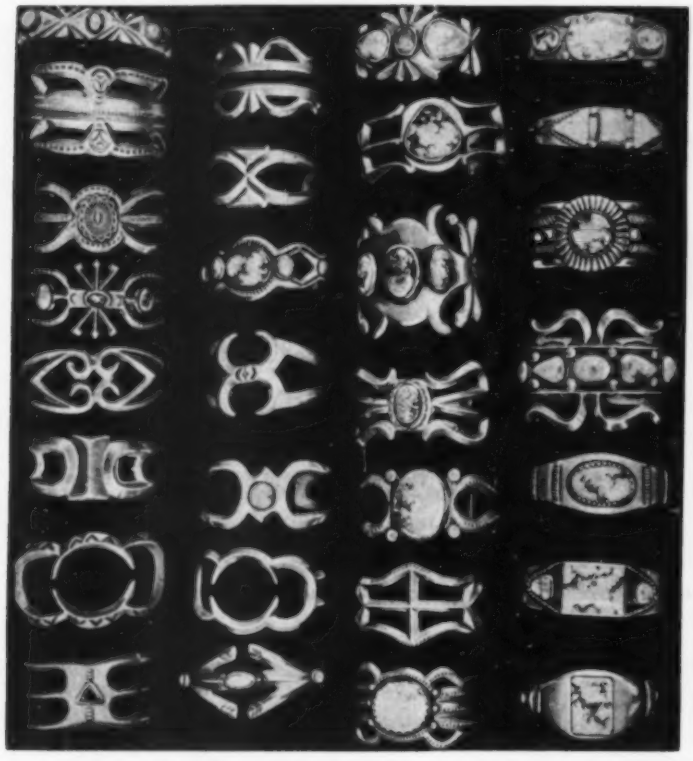
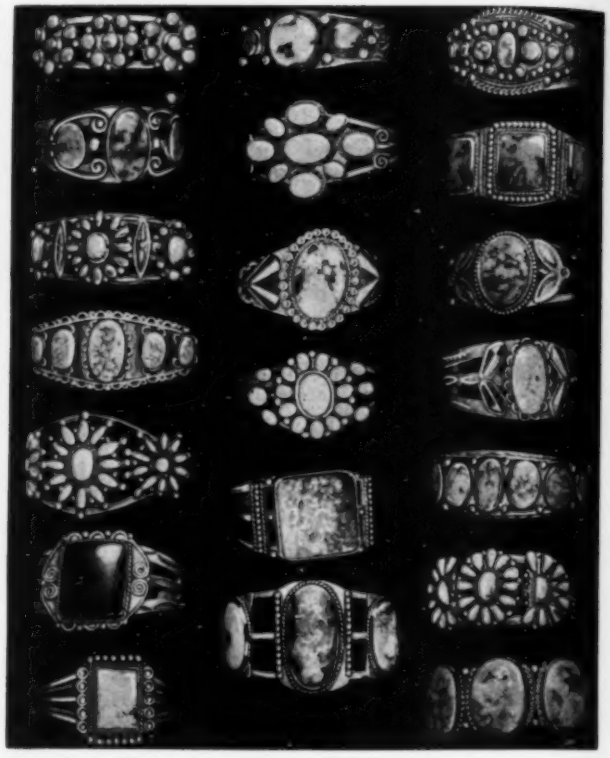


Plate 43

deep scratches will form guides for the lining chisel. With a small liner go over all the lines, then sharpen a larger chisel as shown, and go over the grooves to make them deeper but don't cut through. To make filing easier, anneal the silver again and bend it like the one shown in Figure 1. Now with a good file, either a triangular or a mill file, round off the edges to make nicely rounded fluting, finishing with a finer file. Straighten out the blank again to do the stamping on the edges and the centerpiece. Use a large chisel for the two sides and a small liner to do the rope stamping. Now curve the piece once more and file it to remove the burrs that pushed up in stamping. Then polish it and shape it to fit the wrist.

The two bracelets shown in the lower half, on Plate 43, are imitations of cast bracelets. The author drew both these designs, and while the lower one is the more attractive and easier to make, not having the necessary





Figs. 4 and 5. Cast Indian-made bracelets from the collection of Buck Burshears, La Junta, Colo.

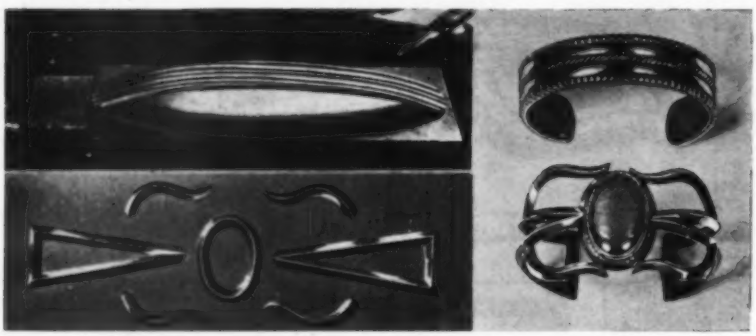


Fig. 1. (Upper left) Blank bent to make filing easier. Fig. 2. (Lower left) Parts assembled for soldering. Fig. 3. (At right) Finished bracelets

turquoise, he made the other one to fit a stone which he happened to have. The triangular wire in this case was hammered out of some heavy square silver wire, in the *V* grooves of a piece of rail iron. It could be hammered out of heavy round wire just as easy. Triangular wire also may be purchased. After hammering it, it must be filed to a uniform size. About 20 inches of triangular wire is needed. The miters should be cut with a jeweler's saw and then filed to fit snugly.

This bracelet is quite difficult to make, and the author confesses that he had to do a lot of refiling and resoldering before it was finally finished. If your wire is annealed, the bending is rather easy. The points of the cowhorn pieces were filed to shape, and the bending was done before it was cut off the long piece of stock. This makes the operation of shaping easier. A common auto plier with rough jaws was used to hold the wire, a piece of leather having been placed over the jaws to prevent marring the silver. The rough jaws kept the leather from slipping.

Do all soldering on a perfectly smooth charcoal block. The author did not wire the pieces, but merely laid them together for soldering. The first pieces soldered were the large triangles, shown in Figure 2. Medium solder was used for this. Then the total assembly shown in Figure 2 was soldered together, and the surplus solder filed off. Then a plate was cut for the base of the bezel housing, and filed to fit the oval. The best way to handle the housing is to solder the bezel onto the base plate with medium solder. Then solder the plate onto the triangular wire oval with easy-flowing solder. The stamping around the bezel on the base plate was done with a very small nail set. This decoration was applied to do away with the severity of the undecorated appearance of the stone setting.

Care must also be taken in shaping it to the wrist. Bend it over a round piece of hardwood and be sure you bend the cowhorn sections to correspond with the long pieces. Quite a bit of bending can be done with your hands. The stone should be set last. The lower sketch shows a much prettier bracelet, but for real beauty it needs five matched stones in the settings shown.

Figures 4 and 5 show two sets of Indian made bracelets that may be of help to anyone desiring to create new designs.

ELECTRICAL INSTALLATION AND PRACTICE — AN INSTRUCTION SHEET

ELMER C. O'DONNELL
Vocational High School
New York City, N. Y.

Exposed Rigid Conduit — Selective Master Control

Object: To provide practice in exposed rigid conduit work and in laying out circuits.

Job: Complete the wiring diagram in Figure 1, so that lamps A, B, C, will each be independently controlled by its own 3-way switch. The electrolier switch is to be so connected in the circuit, that it will *master*

lamp *A, A and B, A, B, and C,* at the will of the operator.

After the wiring diagram has been completed, construct the conduit system on a work board as shown in Figure 2, using close nipples and 3-in. nipples of ½-in. conduit, 4-in. square and 3¼-in. octagon outlet boxes, conduit receptables or pendants and flush switches.

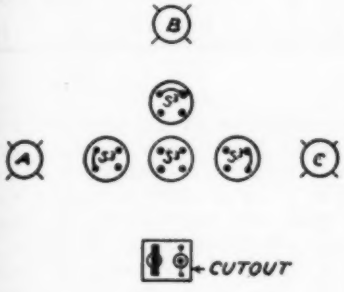


FIG. 1

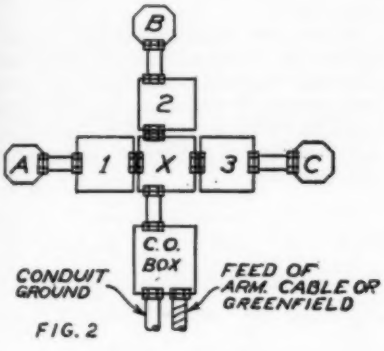


FIG. 2

Construction notes: If desirable, a 3-gang box may be used instead of boxes, 1, *X*, 3, and, or a 3-unit switch may be used instead of the electrolier switch, in which case A, B, C, can be *mastered* singly or in any combination.

Questions:

1. If each lamp on this job required 1 ampere and lamps A and B were already lighted by their respective switches, how much current would there be through switch X (*a*) first turn, (*b*) second turn, (*c*) third turn?
2. What is the standard voltage supplied by the electric companies in New York City for lighting?
3. What is the current rating of the switches used on this job?

References: Croft's Lighting Circuits and Switches, Div. 6.

MEASURING TECHNIQUES AND TESTS

IRVING ROTH

Mt. Vernon, N. Y.

Industrial-arts teachers who despair of ever getting their boys to follow simple instructions or make accurate measurements would do well to make an analysis of the basic causes, and to develop possible solutions for this universal shop problem. During years of experience in mechanical trades and additional years of experience teaching industrial-arts shop classes from the seventh year through high school, I have been convinced that a boy's age or grade in school is no positive assurance that he has acquired the basic fundamentals we expect him to possess when he enters the shop.

Without trying to disparage the work of academic teachers, I have found that in a normal class, as many as 50 per cent of the students are uncertain about the correct method of reading and using a rule graduated to eighths of an inch. Only a small number could handle the sixteenths at all. Make this simple test in your own class. Hold an ordinary 12-inch rule, where the figure 12 has been omitted, before a small group and ask how long the rule is. You will be amazed how often you receive the answer — "11 inches."

Like many other shopmen, I devised massive wall rules and other devices for demonstration purposes. Since some of the boys did not need practice of this type, I devised a simple test on reading a rule, requiring about 10 minutes of their time, by which those boys who were weak in reading a rule could be quickly noted for individual help. Checking these test sheets can be done in a short while by placing them over a light and a master sheet with answers. Once the group requiring individual attention is segregated, intensive individual or group work can be started without wasting the time of those who know how to measure correctly.

The test consists of three mimeographed sheets with information and testing materials combined. It can be used without change as a test since it is unlikely that the answers will be memorized. The instructional material can be used in co-ordination with a lecture-demonstration to the entire class in conjunction with any other teaching aids available. Later the sheets can be used by those boys requiring additional help, in class or at home for study and review. When a student says he is ready for a retest, he can be given the same test sheet over again until he achieves a satisfactory degree of proficiency.

The second big handicap of many boys in the shop is their inability to read and follow simple instructions. One of the most annoying questions to a shopman, after a thoroughgoing demonstration, is the question, "What do I do next?" My feeling is that junior high school boys, in many cases, have been taught to read words, but fail to gather the complete thought in a simple sentence. This condition is not new to shopmen; no one would expect the shop to add reading as a new activity. However, when printed information or instructions are provided, it is not expecting too much to insist that they be read, rather than ask step-by-step instructions, individually of the instructor. This is especially true when the written material is a review of material already presented before the class as a whole, as in the case of the instructional units presented in this article. Where the students are known to have the ability to read, it is wise to insist, right from the beginning, that each individual make a serious effort in helping himself by reading and following instruction sheets and plans. The instructor will find he can devote his time to assistance in quality and method rather than in step-by-step procedure. Where reading ability is hopelessly lacking, the teacher has no choice but to adjust his program to the situation and expect no help from instructional materials except pictures.

The second unit in this pair of measuring tests, "How to Measure With the Rule and Scale," deals with the application of the knowledge previously tested in "How to Read the Rule." Since a demonstration of layout of measurements presupposes a knowledge of reading the rule, this unit cannot be offered until the first unit has been mastered, at least to a reasonable extent. Immediately following a class demonstration of laying out on wood or metal, printed or mimeographed copies of the second unit could be issued as a checkup. The entire unit should be completed within 10 minutes and 15 minutes of the teacher's time is all that is required to check the results by the light and master sheet method. The text matter accompanying the testing units presented here, may or may not be included as part of the test. However, it is strongly recommended that the complete unit be offered to the slow group who need simple explanations for study and review.

Unit 1 — How to Read a Rule

Shopwork requires a knowledge of how to measure lengths, and read a rule accurately. The standard units for measuring lengths are inches, feet, and yards. In the shop, feet, inches, and parts of inches are used mostly. Measurements are made with wood rules, 1

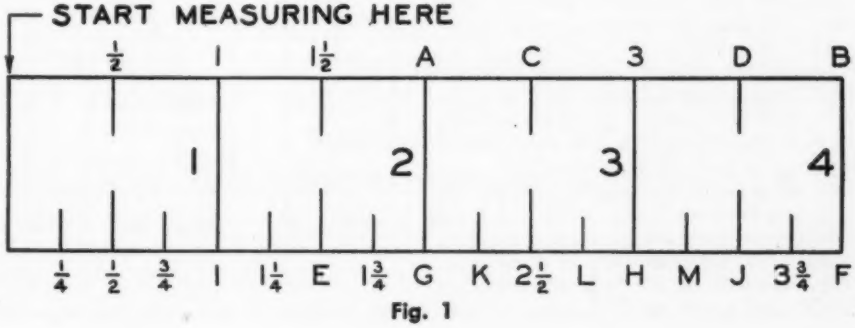


Fig. 1

or 2 ft. long or with metal scales, 6 in. or 12 in. long. Rules are made of wood. Metal rules are called scales, and are more accurate. Yardsticks are most generally made of wood.

Rules for measuring are used starting from the extreme left edge. They are divided into inches by long lines and numbered. Sometimes the last number on the right side is left out because there is no room. A 12-in. rule might have numbers printed only up to 11 in., but the last inch space after the 11 is the twelfth inch.

The inch space is divided by lines showing the half-inch points. The ½-inch measurements are not printed on the rule, but can be figured mentally. Figure 1 shows how each point is read.

The bottom edge of the rule shows how inches are divided to show quarters of an inch. The ¼-in. lines are shorter than the ½-in. lines, and all the ¼-in. lines are the same length. All the quarters of the inch are the same size, just like the quarters of a pie. The first line from the left shows the end of the first space and is the ¼-in. mark. The second line shows where the second space ends and is the point for ¾ in. However, we never say two quarters or two fourths, but change the fraction from ¾ in. to ½ in., which is the same thing.

Read the measurements to the points indicated on the drawing and fill in the blanks below.

Point A measures .....
Point B measures .....
Point C measures .....
Point D measures .....
Point E measures .....
Point F measures .....
Point G measures .....
Point H measures .....
Point J measures .....
Point K measures .....
Point L measures .....
Point M measures .....

Many rules and scales have the inch divided into different units on the top and bottom edges of both sides. Rules used in the shop usually have the ¼-in. spaces each divided into two equal parts. Each of these parts are called eighths or ⅛ in. There are eight eighth parts in an inch. On some scales a number is printed near the left edge, over the quarter-inch mark, telling at a glance into how many spaces each inch on that edge is divided. On the drawing the top edge is divided 8 spaces per inch and the lower edge is divided into 16 spaces per inch.

Each line dividing the ¼-in. space in two is shorter than the ¼-in. line. Each ⅛-in. line is of the same length. On the top edge of the drawing, the first space from the left measures ⅛ in. to the first line. The end of the second space is marked by the longer ¼-in. line. You could count two eighths or ⅜ in., but ⅜ in. can be reduced to ¼ in. The end of the fourth space is marked by the long ½-in. line, equal to four eighth spaces. ⅝ in. equals ¾ in., which equals ½ in. The ¾-in. mark is equal to six eighth spaces, but ⅞ in. reduces to ¾ in.

Fig. 2

Sometimes it is easier to read the rule by locating the nearest inch mark, and count forward or backward. For example, if you want to read the measurement at ⅞ in., it is easier to start at the 1-in. mark. You know each space is an eighth. You know there are eight eighths to the inch. The mark is one full space back from the full inch; therefore, you can easily figure that the point is one space less than eight, or seven eighths of an inch.

Read the measurements of the above rule at the following points:

1. Point A.....	10. Point K.....
2. Point B.....	11. Point L.....
3. Point C.....	12. Point M.....
4. Point D.....	13. Point N.....
5. Point E.....	14. Point P.....
6. Point F.....	15. Point Q.....
7. Point G.....	16. Point R.....
8. Point H.....	17. Point S.....
9. Point J.....	18. Point T.....

On the lower edge of the rule in Figure 3, the inches are divided into 16 parts. Each space is a sixteenth of an inch — 1/16 in. Each eighth-inch space is divided in half by a short line. On a rule these spaces are actually smaller than on the rule in Figure 3 and must be checked very carefully to avoid errors.

One inch equals two halves — 2/2 in. It also equals four quarters — 4/4 in. It is the same as eight eighths — 8/8 in., and also sixteen sixteenths — 16/16 in. In that case 8/16 in. equals ½ in. Count the spaces yourself. 4/16 in. equals ¼ in., and 2/16 in. equals ⅛ in. Count them.

It is easy to read the one fourths, one halves, and three fourths on this edge of the rule because those are the two longest division lines. The eighths are harder because the shorter lines are harder to locate. To read the rule to sixteenths, first locate the nearest larger subdivision. To read point B, first find the nearest large division which is point A, equal to ½ in. or 8/16 in. Point B is one space after A, so 1/16 in. added to 8/16 gives 9/16 in. You might have started at the left edge of the rule and started counting the spaces, but they are so small you could easily make a mistake. Now figure point C. The nearest quarter inch is point D, which is 1¾ in., or 1 12/16 in. Point C is one space less than 1 12/16 in. 12/16 minus 1/16 equals 11/16. Point C measures 1 11/16 in.

In precision machine-shop work, scales are divided into thirty seconds and sixty fourths. For work figured in decimals, that is tenths and hundredths, scales are divided into even one hundredths. Sometimes it is necessary to use magnifying glasses to make accurate measurements.

Read the measurements at the following points:

E.....	K.....	P.....	U.....
F.....	L.....	Q.....	V.....
G.....	M.....	R.....	W.....
H.....	N.....	S.....	X.....
J.....	O.....	T.....	Y.....

Unit 2 — How to Measure With the Rule and Scale

In the shop you should be able to measure and mark materials to an accuracy of one sixteenth of an inch if necessary. To make accurate measurements, you must have a starting point. On metal, if the edge is ragged, a straight line should be laid out and the edge cut straight. In measuring the width of a board, measure from an edge that is straight and square. If you must measure along the length of a board start your measurement from a square end. If the end is not square, use a try square held against a good edge to

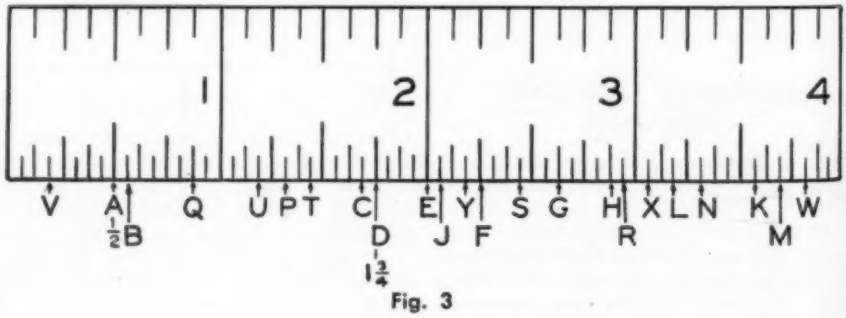


Fig. 3

square a starting line. Use this line as a starting point in laying out to length. The rule can be placed flat on the board, or held on its edge.

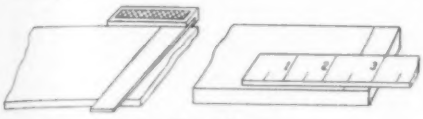


Fig. 4

Fig. 5

The mark indicating the amount to be laid off can be placed on the starting line, so that the beginning edge of the rule can be used as a straight edge along which a pencil mark can be made. Be sure to use a sharp pointed pencil, pressed firmly into the corner made by the rule and the work. See Figure 5.

In laying out work on metal, a scratch awl is used instead of a pencil. The scratch awl has a hardened point and will make clear sharp lines on the metal surface. Measurements on metal must often be made even more accurately than on wood. In order to obtain greater accuracy rules are not used in metal-

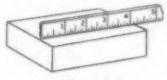


Fig. 6

work. Metal scales are used instead. The thickness of the rule might throw off the measurements too much. For very accurate measuring, the scale or rule should not be laid flat on the work, but held on edge so that the markings on the rule touch the work directly. See Figure 6.

Use a wood rule or a steel scale and measure on each horizontal line the measurement indicated. Be sure to start your measurement from the vertical line on the left side of the paper.

For this test, the instructor must prepare a sheet containing 25 lines 6 in. long upon which the students are to lay out the following dimensions: 3 in., 2¼ in., 3¾ in., 4½ in., 5⅛ in., 3⅝ in., 2⅜ in., 1⅞ in., 1 1/16 in., 5/16 in., 5 9/16 in., 3 15/16 in., 1 11/16 in., 2 15/16 in., 4 3/16 in., 3 13/16 in., 5 5/16 in., 2 7/16 in., 1 9/16 in., 4 11/16 in., 1 13/16 in., 3⅞ in., 4 15/16 in., 5¾ in., and 3½ in.

For the next test, the instructor must prepare a sheet containing 25 lines of various lengths up to 6 in. long.

The lines should be of the following dimensions: 3½ in., 4¾ in., 5¼ in., 2⅛ in., 3⅞ in., 1⅝ in., 4⅜ in., 2 1/16 in., 3 15/16 in., 5 5/16 in., 4 11/16 in., 2 3/16 in., 1 7/16 in., 1 3/16 in., 3 9/16 in., 4 7/16 in., 1 5/16 in., 2¾ in., 3 1/16 in., 4 3/16 in., 2 5/16 in., 1 9/16 in., 2 11/16 in., 4 13/16 in., 2 15/16 in.

The student should be directed to measure these lines to the nearest quarter, eighth, or sixteenth of an inch. He should also be asked to reduce all fractions to the smallest common fraction. All measurements should be taken from the vertical line at the extreme left to the end of each horizontal line. The answers should be placed at the right side of the sheet.

Plastic Lapel Pins

1. ENLARGE THE PLANS TO THE PROPER SIZE. IF A QUANTITY IS TO BE MADE IT WOULD BE BEST TO MAKE A METAL TEMPLATE.
(IF MADE OF SILVER AND ONLY ENLARGED TO ½ SIZE THEY MAKE ATTRACTIVE SCATTER PINS.)

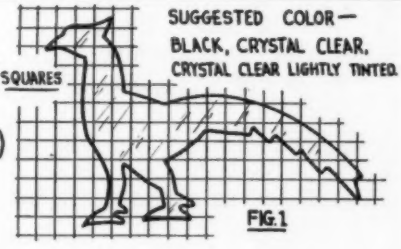


FIG. 1

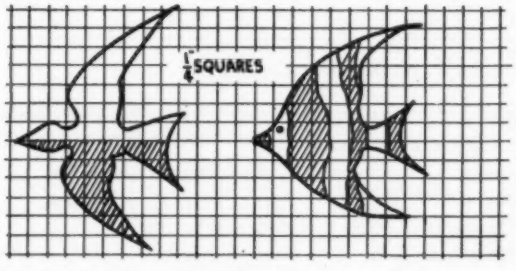


FIG. 2

2. TRANSFER DESIGN TO ⅛" THICK OPAQUE WHITE LUCITE OR PLEXIGLAS. OTHER COLORS WHERE NOTED.

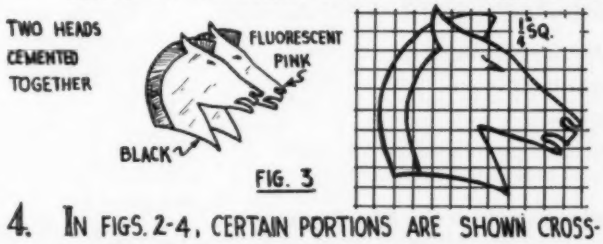


FIG. 3

3. CUT OUT AND POLISH IN THE USUAL MANNER. DRILL EYE HOLES WHERE NECESSARY AND FILL HOLES WITH CRAYON WAX.

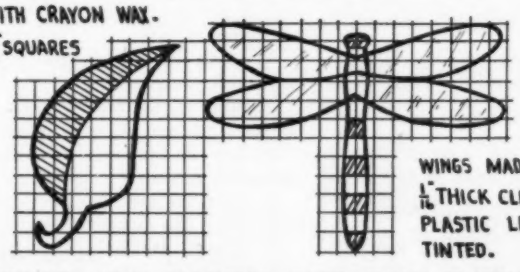


FIG. 4

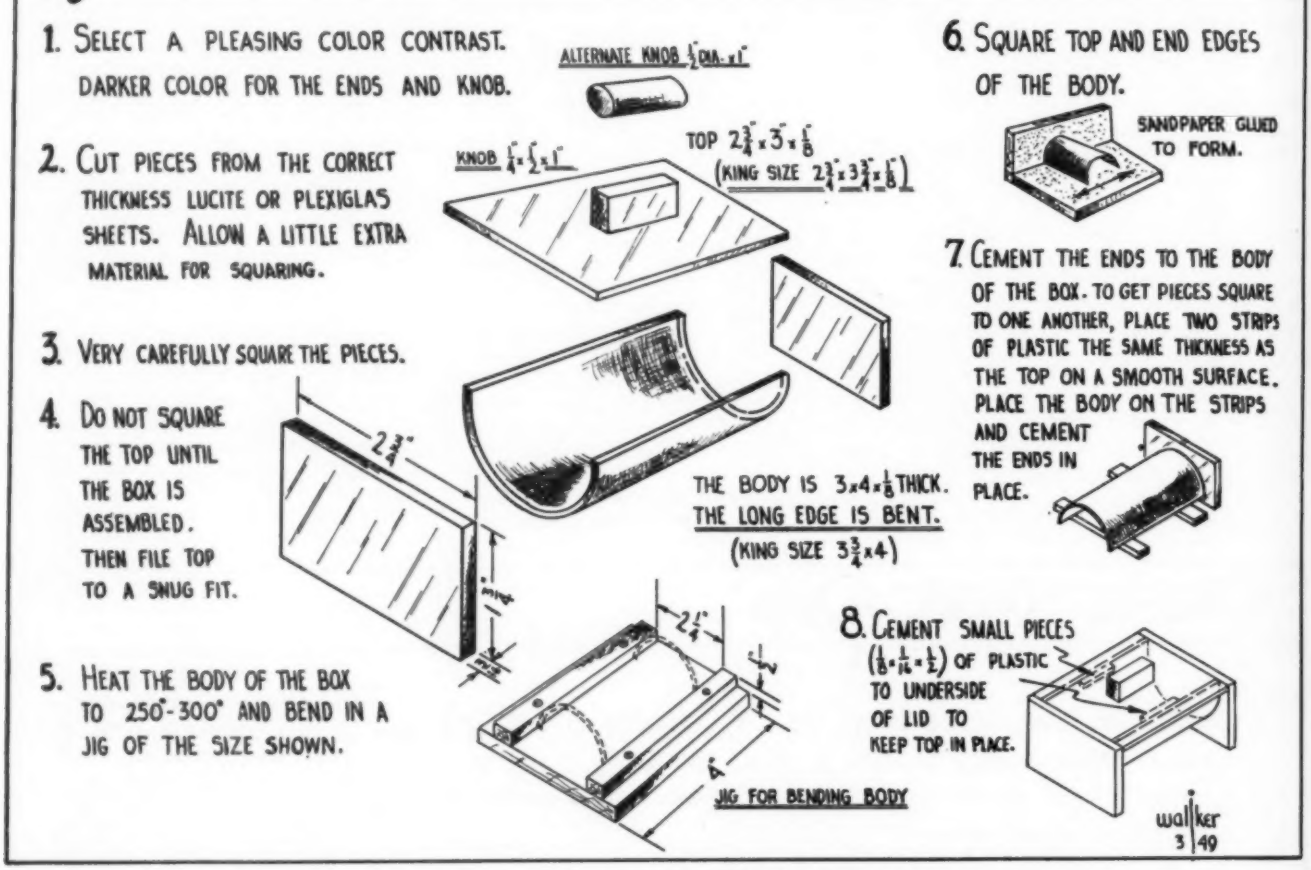
4. IN FIGS. 2-4, CERTAIN PORTIONS ARE SHOWN CROSS-HATCHED ▨. THESE ARE THE AREAS THAT ARE DYED. THE OTHER PARTS ARE BLOCKED OUT WITH MASKING TAPE. USE A COLD DYE AS HEAT HAS A TENDENCY TO MAKE THE TAPE SOFT CAUSING A FEATHERED DYE EDGE. FOLLOW INSTRUCTIONS ON DYE CONTAINER.

5. REMOVE THE MASKING TAPE, CLEAN THOROUGHLY, AND FASTEN ON PIN BACK

JOHN R. WALKER 1949

Plastic lapel pins submitted by John R. Walker, Bel Air, Md.

Plastic Cigarette Box


1. SELECT A PLEASING COLOR CONTRAST. DARKER COLOR FOR THE ENDS AND KNOB.
ALTERNATE KNOB ½ DIA. x 1"
2. CUT PIECES FROM THE CORRECT THICKNESS LUCITE OR PLEXIGLAS SHEETS. ALLOW A LITTLE EXTRA MATERIAL FOR SQUARING.
KNOB ¼" x ½" x 1"
TOP 2¾" x 3" x ⅛"
(KING SIZE 2¾" x 3¾" x ⅛")
3. VERY CAREFULLY SQUARE THE PIECES.
4. DO NOT SQUARE THE TOP UNTIL THE BOX IS ASSEMBLED. THEN FILE TOP TO A SNUG FIT.
2¾"
THE BODY IS 3 x 4 x ⅛ THICK. THE LONG EDGE IS BENT.
(KING SIZE 3¾ x 4)
5. HEAT THE BODY OF THE BOX TO 250°-300° AND BEND IN A JIG OF THE SIZE SHOWN.
2¼"
4"
JIG FOR BENDING BODY
6. SQUARE TOP AND END EDGES OF THE BODY.
SANDPAPER GLUED TO FORM.
7. CEMENT THE ENDS TO THE BODY OF THE BOX. TO GET PIECES SQUARE TO ONE ANOTHER, PLACE TWO STRIPS OF PLASTIC THE SAME THICKNESS AS THE TOP ON A SMOOTH SURFACE. PLACE THE BODY ON THE STRIPS AND CEMENT THE ENDS IN PLACE.
8. CEMENT SMALL PIECES (⅛ x 1/16 x ½) OF PLASTIC TO UNDERSIDE OF LID TO KEEP TOP IN PLACE.
walker
3 | 49

Plastic cigarette box submitted by John R. Walker, Bel Air, Md.

ELEMENTARY AUTO MECHANICS

FRANK B. MILLER
Central High School
Tulsa, Okla.

(Conclusion from page 34A of the February, 1950, issue)

Assignment Sheet No. 58 — Running a Motor

Why this is done:

This operation is the chief climax or proof of your knowledge and proficiency in this course. To do this successfully, whether the first time or after a number of difficulties, testing your ability to find and correct trouble, means that you have gained a fair degree of training in this field.

Procedure:

1. Fill crankcase with oil.
2. Check over valve adjustment and valve tappet lock nuts.
3. Adjust the distributor points.
4. Time the ignition.
5. Wire the starter circuit.
6. Wire the ignition circuit.
7. Connect water lines.
8. Connect exhaust outlet.
9. Fill the carburetor.
10. Start the motor with the starter.
11. If motor fails to start after *three short* depressions of the starter switch, check over each operation for errors, particularly, timing, wiring and fuel.
12. With motor running, lash the valves.
13. With motor running, adjust the carburetor.

Questions:

1. What would be wrong if the spark plug wires all gave off a good spark when shorted against the block but the motor refused to run? Give two possible difficulties.
2. What would be the trouble if investigation revealed that there was no interruption of the primary circuit when the motor turned over?
3. What can be done to overcome the failure of fuel mixture to enter the cylinder?

Text reference: ....

Assignment Sheet No. 59 — Lashing Valves

Why this is done:

In order to get a more accurate adjustment of valve clearance, it is necessary to make the final adjustment under actual operation conditions because the changes in heat and other controlling factors are not uniform and cannot be accurately measured in advance.

Procedure:

1. Select the proper size tappet wrenches and thickness gauges.
2. Start the motor, let it run a few minutes to warm up, and adjust it to idling speed.
3. Try the first valve to determine the adjustment needed.
4. Hold the wrenches on the moving tappet and loosen the lock nut.
5. Adjust clearance to the desired amount and tighten the lock nut.
6. Recheck clearance and make any corrections needed to permit the proper size gauge to slip through the gap but not permit the first oversized gauge to slip through.
7. Repeat in turn for all other valves.

Questions:

1. Why wait until the motor warms up before making valve adjustments?
2. How can a thickness gauge slip between the valve stem and lifter when the lifter is pushing up on the valve stem part of the time?
3. How could a hot valve clearance adjustment be made on a V-type motor when the valves are not accessible with the motor running?

Text reference: ....

Assignment Sheet No. 60 — Removing and Cleaning a Generator

Why this is done:

In order to overhaul a generator and also to clean the motor block under it, the generator must be removed from its supporting base.

Procedure:

1. If the generator is driven by the fan belt, remove the adjusting arm bolt, the supporting bolts, and lift the generator off the motor.
2. If driven by the timing gears, loosen the clamping bolt or disconnect the drive coupling and lift the generator off.
3. Wash the generator case with kerosene and clean the block under the generator.
4. Replace the generator, checking to see that the connections run free. If the removal of the generator freed the timing chain, replace the chain and time the valves.

Questions:

1. What are two advantages of generator belt drive?
2. Give at least one advantage of gear drive.
3. What detrimental result will follow an accumulation of dirt and grease on a generator?

Text reference: ....

Assignment Sheet No. 61 — Disassembling a Multiple Disk Clutch

Why this is done:

In order to check over the condition of the clutch facings, the clutch must be taken apart.

Procedure:

1. Place the assembled clutch under pressure in an arbor press, with the pressure plate up.
2. Remove the nuts holding the clutch together.
3. Gradually release the pressure of the press, holding the pressure plate to keep it from tipping up sideways.
4. Move the clutch parts in position to the bench, and lift off one part at a time, noting their correct place and position in the assembly.
5. Clean off all parts.
6. Inspect the clutch facings and replace any worn down to a thickness less than 5/16 in. through both facings.
7. Assemble the clutch and place in the press.
8. Tighten the pressure of the press gradually, guiding the bolts through the holes in the pressure plate.
9. Replace nuts and tighten them down.
10. Remove assembled clutch from the press.

Questions:

1. What would happen if the clutch were disassembled without being put in the press?
2. What purpose does the clutch spring serve?
3. What connection is there between the operation of the clutch pedal and the action of the arbor press?

Text reference: ....

Assignment Sheet No. 62 — Removing a Clutch From a Motor

Why this is done:

In order to inspect clutch facings and replace worn-out parts, it is necessary to remove the clutch from the motor.

Procedure:

1. Remove the transmission from the motor.
2. Remove the bolts holding the clutch cover to the flywheel, backing off each bolt a few turns at a time, until the pressure is relieved.

CAUTION: Do *not* remove bolts holding pressure plate assembly together.

3. Lift clutch out of flywheel and housing.
4. After inspecting the clutch, replace it in the housing and bolt it in place.

NOTE: If a single plate clutch, use a pilot tool to line up the clutch disk while the clutch cover and pressure plate assembly are being bolted on. If a multiple disk clutch, line up the teeth of the two sets of plates before installing.

5. Replace transmission and clutch throwout bearing.

Questions:

1. What is the difference between flywheel action with a single plate clutch and with a multiple disk clutch?
2. What would result from removing all the flywheel bolts but one before removing that one?
3. What is the reason for the change in most cars from multiple disk to single plate clutch?

Text reference: ....

Assignment Sheet No. 63 — Removing and Replacing a Transmission

Why this is done:

In order to work over the parts of a transmission, and also in order to give access to the clutch, it is necessary to remove the transmission from the motor.

Procedure:

Loosen all bolts holding the transmission to the clutch housing.

2. Remove all but two top bolts.
3. Make arrangements to have transmission supported safely, and remove the last two bolts, lowering the transmission to the floor.
4. Remove the gear shift lever and top and wash out the transmission with kerosene.
5. Study the operation of the gears, and determine the gear ratio in the different speed settings.
6. Diagram a side view of the gear and shaft arrangement in *neutral,* using arrows and initials (H.L.S. and R.) to show direction of motion of each gear that *slides,* for each speed shift. Show four shafts and eight gears in their proper relative place and proportion, using a single line to represent each gear and each shaft. No detailed outlines of teeth or shape, and no outline of the case is necessary.
7. Replace shift lever and top and reinstall on motor.
8. Hand in diagram and ratio report, with instructor's O.K. on diagram.

Questions:

1. What would be the probable result of dropping the transmission on the floor? Why?
2. What is the relation between speed and power as affected by shifting gears?
3. Why is a transmission necessary in an automobile?

Text reference: ....

Assignment Sheet No. 64 — Disassembling and Assembling a Transmission

Why this is done:

In order to inspect and replace worn parts, it is necessary to disassemble the various units of a transmission.

Procedure:

1. Remove top of transmission case with shifting lever.
2. Remove the universal joint plate from the rear of the transmission case, and the drive shaft nut, if necessary.
3. Remove the clutch shaft plate from the front of the transmission case.
4. Drive out the clutch shaft and bearing by striking the inner end of the shaft and bearing inside the case, using a wooden block and hammer.
5. Hammer the splined driving gear shaft and bearing out of the back of the case in the same manner.
6. Locate and remove the locking plate, pin or key, or whatever locking device is used to hold in the countershaft, and then drive out the shaft, using a wooden block.
7. Lift out the countershaft gear cluster.
8. Remove the locking device holding in the reverse idler gear shaft, and drive out the shaft, then lifting out the gear.
9. Clean all parts in kerosene, wipe dry and oil bearing surfaces lightly.
10. Clean out the case with kerosene and wipe dry.
11. Replace all parts in reverse order, using a wooden block wherever necessary to hammer parts in place.

Questions:

1. Why is one type of transmission called "sliding gear"?
2. How many shafts and how many gears are revolving when you step on the starter with the clutch engaged and the gear shift lever in neutral? Why should you disengage the clutch when starting in the winter?

Text reference: ....

Assignment Sheet No. 65 — Disassembling and Assembling a Differential

Why this is done:

In order to inspect and repair a differential it is necessary that it be taken apart.

Procedure:

1. Remove the cap screws and lift off the rear cover plate.
2. If separable, remove the pinion gear housing from the axle housing.
3. Remove the two bearing retaining caps and lift out the ring gear and differential assembly.
4. Remove the adjusting rings, tapered rings, and bearings.
5. Remove the bolts and separate the differential case halves.
6. Lift out side gears, spider and spider gears for cleaning and inspection and reassemble on the bench in their correct position for studying.
7. To reassemble, bolt the differential case halves together with spider and gears in place, and slip the bearings, tapered rings, and adjusting rings in place on the case.
8. Put the differential case in the differential carrier and bolt the bearing retaining caps in place loosely.
9. Set the adjusting rings so that the moving parts turn freely, and tighten up the bearing cap bolts.
10. Check the mesh of the ring and pinion gears for a snug fit without binding, changing set of adjusting rings if necessary. See Assignment Sheet No. 66.
11. If separable, rebolt the pinion gear housing to the axle housing, checking gear mesh afterwards.

Questions:

1. What gears revolve when the car is moving straight ahead on dry pavement?
2. What gears are moving when one wheel is spinning in the mud and one standing still on the pavement?
3. Under what normal driving conditions do the spider gears revolve on the spider?

Text reference: . . . . . .

Assignment Sheet No. 66 — Adjusting a Differential

Why this is done:

For proper performance of the differential with quiet effective gear operation, adjustment must be made to keep the ring gear in full mesh with the pinion gear, with just enough play to prevent binding.

Procedure:

1. Examine the ring and pinion gear connection to see that the two sets of teeth are meshing their full lengths.
2. Correct any partial meshing by turning the pinion adjusting ring forward or back, carrying the pinion gear with it, and lock in place when adjusted.
3. Shift the ring gear and differential case over by turning one adjusting ring in and the other out until the ring gear just starts to bind against the pinion gear. Be sure the case is still snug in its bearings.
4. Back off the setting of the adjusting rings about one-half inch, until a small amount of clearance appears between the ring and pinion gear. This should be from .006″ to .008″. Check clearance carefully.
5. Lock adjusting rings in place.

Questions:

1. What would result from operating a differential with the pinion gear only half meshed with the ring gear?
2. Why have backlash between the ring and pinion gear?

Text reference: . . . . . .

MODERNISTIC SPICE SHELF

WILLIAM G. FORD

Yates Center, Kans.

This modernistic spice shelf not only makes a good project in hand woodwork, but makes a nice addition to the kitchen. It was designed to hold two rows of square spice bottles, but also makes a convenient place to keep most of the small spice cans and bottles that will be found around the average kitchen.

The shelf is made entirely of white or yellow pine. It will be noted that the thickness of all parts is ⅝ in. except the bottom shelf, which is of ½-in. material. The back is made of two pieces of 1 by 8-in. stock, joined with a doweled butt joint. The radii of the four corners on the back area are 2½ in. while the three radii of the curves on the ends are 2 in.

The middle shelf is mounted on the longitudinal center line and all parts are spaced so there will be equal space on each end and at the top and bottom.

The parts may be assembled with flat head screws, countersunk, and filled to cover the screw slots. They may also be assembled with glue and finish nails sunk and filled.

The shelf is finished with two coats of white enamel base, and one coat of white enamel. The edges may be trimmed to match kitchen color combinations and decals may also be added for decorative effects.

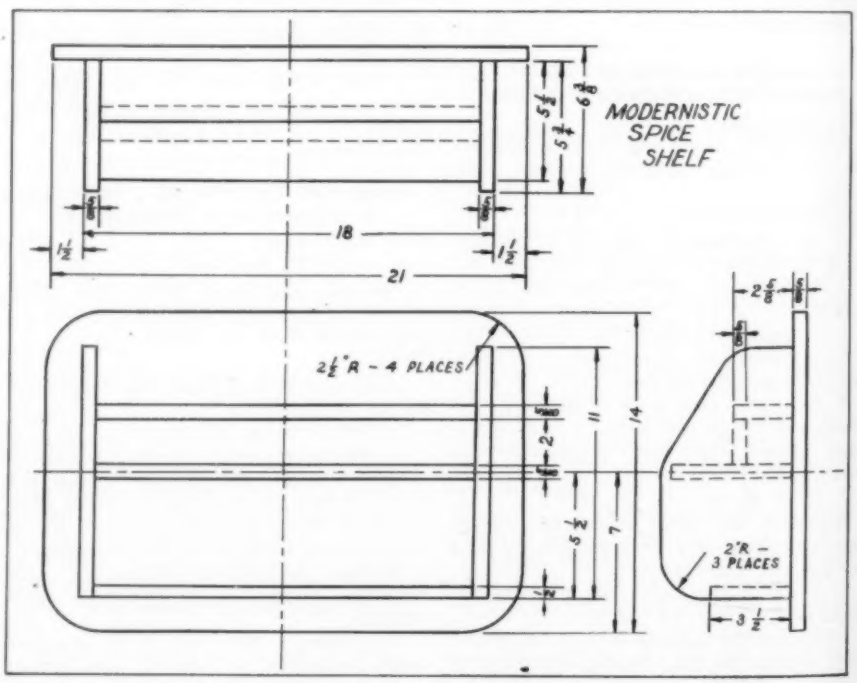
The shelf is hung on the wall by attaching two ⅜-in. screweyes equally spaced from the center along the top edge of the back.

For additional features, five ½-in. cup hooks may be screwed into the bottom of the bottom shelf ½ in. back from the front edge, and equally spaced on 3-in. centers. A knife rack may be added and may be placed on either end or both ends of the shelf. The knife rack is made from a block of wood 1¼ by 1½ by 5 in., and the saw cuts for the knives are made ⅛ in. wide and 1 in. deep on 1-in. centers. The knife rack is glued on the end, the top edge even with the top of the middle shelf, and butted against the back.

YOUTH

Youth has one great element in its favor: It can live in the future! The world of tomorrow belongs to the young men of today, and they can begin shaping that world now. No age has ever presented the tremendous opportunities of the present, but along with these opportunities are proportionate responsibilities. With the changing wheel of ambition, boys no longer regard the talkative professions as more important than the manual. They realize that there are gigantic tasks to be done, and that these will be accomplished by doers rather than talkers. But first must come the lesser day-by-day tasks. On these will depend the greater tasks of the future.

— *Henry Ford.*



Modernistic spice shelf

Tool Design Assignment Sheets

CLIFFORD L. YARD

State Teachers College
Millersville, Pa.

The assignment sheets for tool designing presented herewith have been taken from notes taken during three years of work in engineering departments during the war. They are actual problems that were faced in industry. The seven assignment sheets are arranged in a graduated scale of difficulty for instructional purposes.

Tool designing is one of the most important of all the divisions of drafting, and more attention should be given to it in school drafting rooms. Then, too, problems such as those shown on the seven plates, provide for creative development of the imagination along mechanical lines more than most other kinds of drafting.

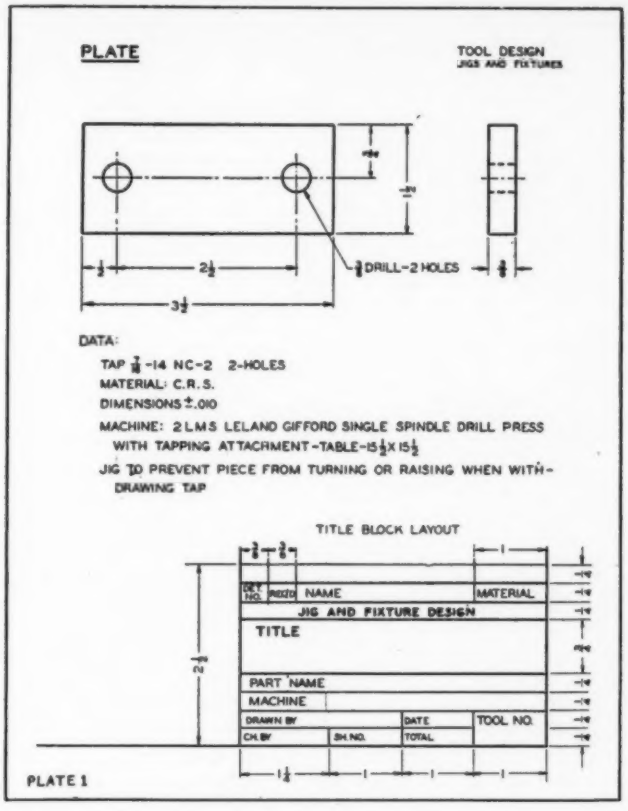
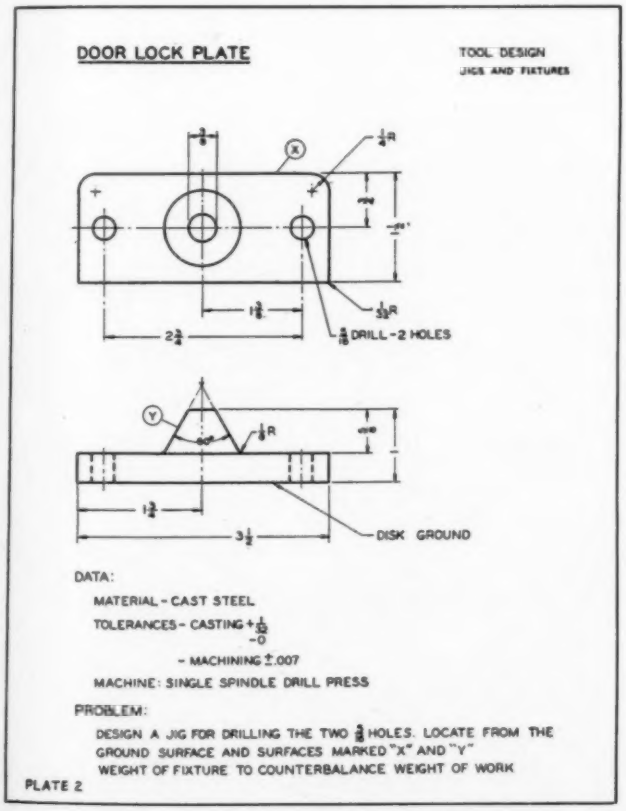
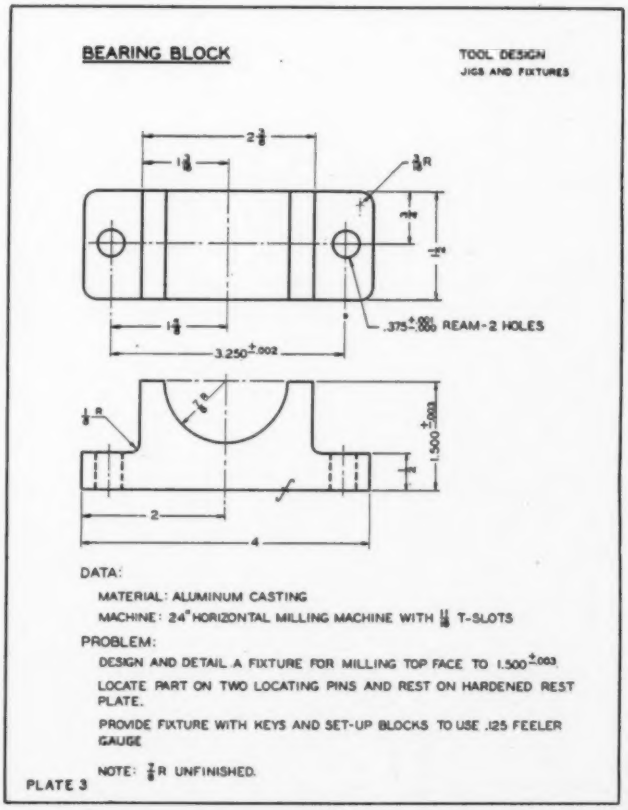


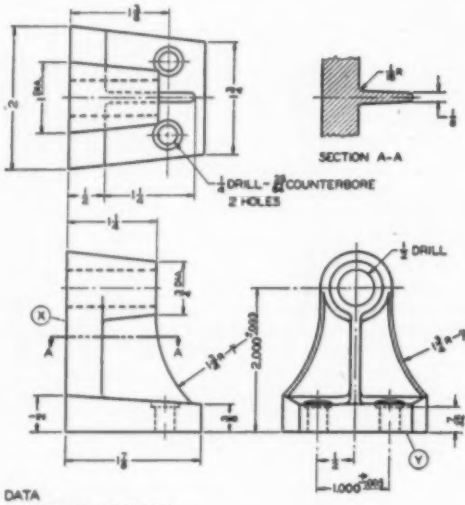
PLATE 1


DOOR LOCK PLATE
TOOL DESIGN
JIGS AND FIXTURES
⅜ DRILL-2 HOLES
DISK GROUND
DATA:
MATERIAL - CAST STEEL
TOLERANCES - CASTING +⅛ -0
- MACHINING ±.007
MACHINE: SINGLE SPINDLE DRILL PRESS
PROBLEM:
DESIGN A JIG FOR DRILLING THE TWO ⅜ HOLES. LOCATE FROM THE GROUND SURFACE AND SURFACES MARKED "X" AND "Y"
WEIGHT OF FIXTURE TO COUNTERBALANCE WEIGHT OF WORK
PLATE 2


BEARING BLOCK
TOOL DESIGN
JIGS AND FIXTURES
.375 REAM-2 HOLES
3.250±.002
1.500±.003
DATA:
MATERIAL: ALUMINUM CASTING
MACHINE: 24" HORIZONTAL MILLING MACHINE WITH ⅝ T-SLOTS
PROBLEM:
DESIGN AND DETAIL A FIXTURE FOR MILLING TOP FACE TO 1.500±.003
LOCATE PART ON TWO LOCATING PINS AND REST ON HARDENED REST PLATE.
PROVIDE FIXTURE WITH KEYS AND SET-UP BLOCKS TO USE .125 FEELER GAUGE
NOTE: ⅜R UNFINISHED.
PLATE 3

SHAFT BRACKET

TOOL DESIGN
JIGS AND FIXTURES



DATA

MATERIAL - CAST IRON

TOLERANCES - CASTING $\pm\frac{1}{32}$ MACHINING $\pm.007$ UNLESS OTHERWISE SPECIFIED

MACHINES - 24" HORIZONTAL MILLING MACHINE
- SINGLE SPINDLE DRILL PRESS

PROBLEMS:

A - DESIGN A JIG FOR MILLING SURFACE "X" OR "Y"

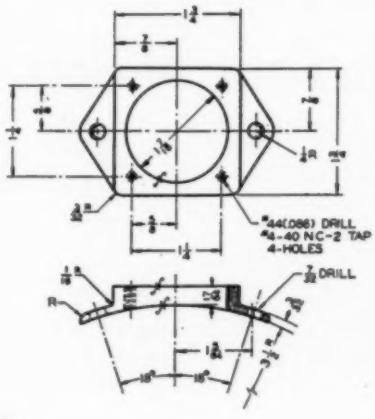
B - DESIGN A JIG FOR DRILLING 1/2-INCH SHAFT HOLE

C - DESIGN A JIG FOR DRILLING AND COUNTERBORING THE TWO 1/4" HOLES

PLATE 4

PIPE SUPPORT

TOOL DESIGN
JIGS AND FIXTURES



DATA:

MATERIAL - BRASS

MACHINE - SINGLE SPINDLE DRILL PRESS

TOLERANCES - MACHINING $\pm.005$

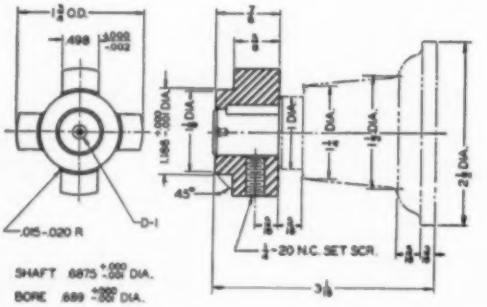
PROBLEM -

DESIGN A FIXTURE FOR DRILLING THE TWO $\frac{7}{32}$ HOLES

PLATE 5

COUPLING

TOOL DESIGN
JIGS AND FIXTURES



SHAFT .6875 $^{+.000}_{-.001}$ DIA.

BORE .689 $^{+.000}_{-.001}$ DIA.

DATA

MATERIAL - TOOL STEEL

PROBLEM

DESIGN A MACHINE TO PULL THE COUPLING FROM ITS SHAFT

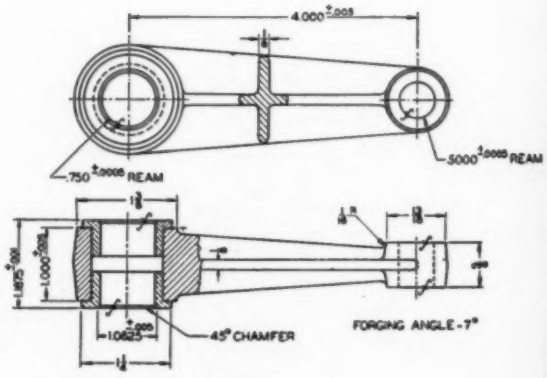
TITLE OF DRAWING - "COUPLING PULLER"

MAKE USE OF THE CENTER-DRILL HOLE

PLATE 6

CONNECTING-ROD BUSHING

TOOL DESIGN
JIGS AND FIXTURES



DATA:

MATERIAL - CONNECTING ROD - M.S.
- BUSHING - BRONZE

MACHINE - GENERAL PURPOSE VERTICAL MILLING MACHINE

PROBLEM:

DESIGN A JIG FOR FACING AND CHAMFERING OUTER ENDS OF THE BUSHINGS

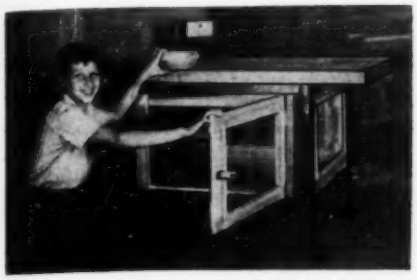
DESIGN A FACING AND CHAMFERING TOOL

PLATE 7

MORE STORAGE SPACE FOR THE SHOP

ROBERT C. WASON
Old Greenwich, Conn.

Safe storage for materials and student projects was much needed in the industrial-arts shop at Riverside School. For lack of other facilities the shop was used for diverse activities such as band practice, girl-scout meetings, and church fairs. Under these conditions projects left on open shelves were always getting misplaced.



Storage space under shelf

An answer to this problem was found by utilizing under bench space. The woodworking benches, of metal construction, were fitted with platforms of ¾-in. lumber across the stretchers. Simple frames were fitted into the end openings and into one side.

The remaining side was filled with a hinged door which, with the frames, was covered with ½-in. mesh hardware cloth stapled securely in place. Miter-jointed molding on the edges of the cloth gives a neat appearance. Painted and padlocked, these lockers provide attractive and adequate safe storage.

HOMEMADE EYESHIELDS FOR THE GRINDER

DeWITT HUNT
School of Industrial-Arts Education
Oklahoma A. & M. College
Stillwater, Okla.

One of the essentials in the guarding and operation of an abrasive wheel in the school shop is a satisfactory eyeshield. The one shown herewith was developed at the Oklahoma A. & M. College under the direction of the writer of this article. Very excellent grinder eyeshields are available from several sources but the expense of installing these commercially built eyeshields may run as high as forty dollars or more for a two-wheel grinder stand. The actual cost of the eyeshields described in this article includes the price of a small piece of safety glass, and a piece of extension cord, plus a few cents worth of aluminum used in the casting.

Figure 1 shows the assembled grinder. The two eyeshields, which were built in the college shops, have been in use for several years. A standard brass shell socket was fastened into the shield by using continuous thread nipple. The extension cord used was selected for toughness and durability and the two lights are wired into the starting switch so that the lights are turned on each time the grinder is started.

Fig. 1. An adequately guarded grinder used in the welding shops. Note the forked work rests

Figure 2 shows the details of the fastening and adjusting mechanism. These parts were made of steel, but they also may be made of wood. The eyeshield is fully adjustable which cannot be said of some of the purchased devices. It may be turned back entirely away from the grinding wheel, or it can be adjusted close to the wheel even after the grinding wheel has been worn down to a small diameter.

The pattern is not difficult to make. Once a pattern is available, castings can be produced in any school foundry where aluminum can be melted. The aluminum casting can be cleaned up most satisfactorily on a belt sander. The rabbet for the glass can be used as it comes from the foundry; however, if an end mill is available, the rabbet may be made uniform and even by machining it.

The lights used in the grinder eyeshield

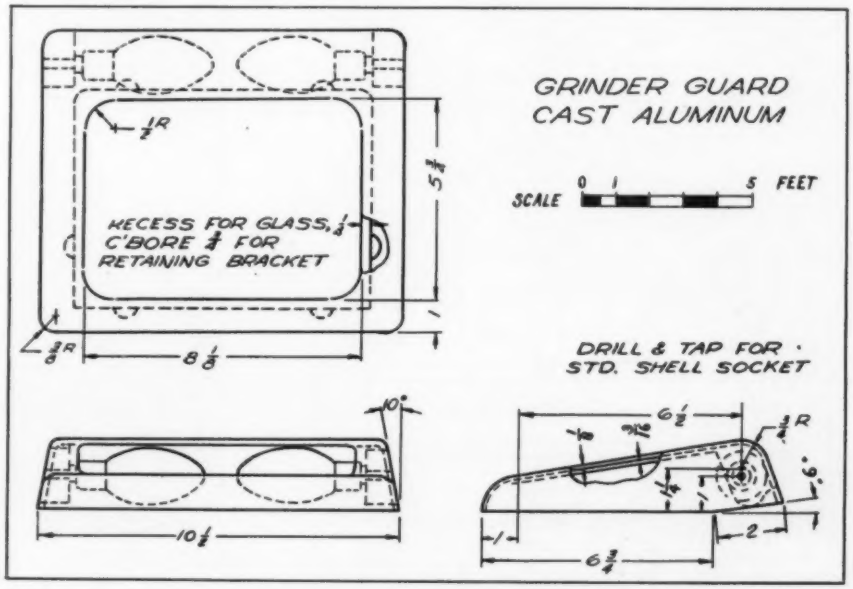


Fig. 2. Details of grinder guard

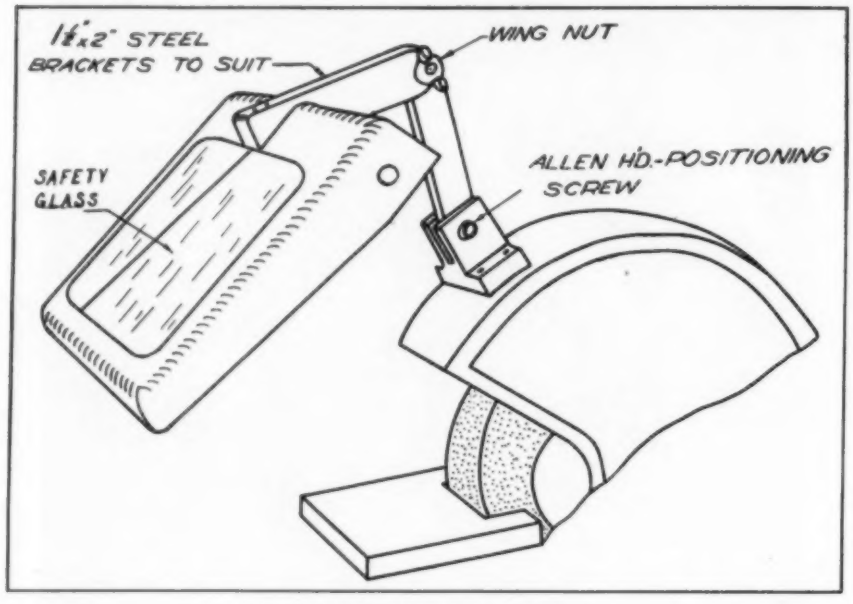


Fig. 3. Assembly of grinder guard

should be a special type made to withstand vibration and shock. Light bulb manufacturers' catalogs include lights of this specification. Otherwise, the so-called candelabra light bulb has given reasonable satisfaction in that it lasts a considerable length of time under rough usage in the department welding shop in which classes are scheduled more than fifty hours per week.

WINDOW DEVICE FOR DARKENING CLASSROOMS

HAROLD HAINFELD
Roosevelt School
Union City, N. J.

The device described herein is an adjustable louver, resembling a Venetian blind, for use in windows of a classroom to exclude daylight when motion pictures, film strips, lantern slides, or opaque projectors are used. Installed permanently or semipermanently it is operated by a handle which holds the louvers in an open or closed position.

The materials used in construction are wood, masonite, metal strip tubing, and the necessary nails and screws. Figure 1 shows a partly exploded overall view with the louver opened slightly to show details of construction. The details in Figure 2 explain the various parts which must be especially made. The diagrams and the list of material have been made using as a model a window with the inside dimensions of 65 in. in height and 35 in. in width. The pieces (G and H) in Figure 1 can be increased in size to accommodate larger windows. The most convenient method to accommodate shorter windows is to eliminate one of the louvers (F) and make proper adjustments at the sides (A) and top (H).

Special attention is called to the fact that in Figure 2, handle (K) operates the elevating rod and lever (M and N) formed of ½-in. metal tubing which connects to wooden strip (J) by special hinge (P). Observe in making part (N) that the shorter arm is bent 45 deg. from the position of the longer arc as depicted in the side view. It is necessary that all wood and masonite parts be constructed first and assembled as shown in Figure 1. Placing part (A) in position locks the assembly, after which the hardware may be attached.

If conditions exist where large audiences are assembled for lengthy periods and no system of ventilation is provided other than win-

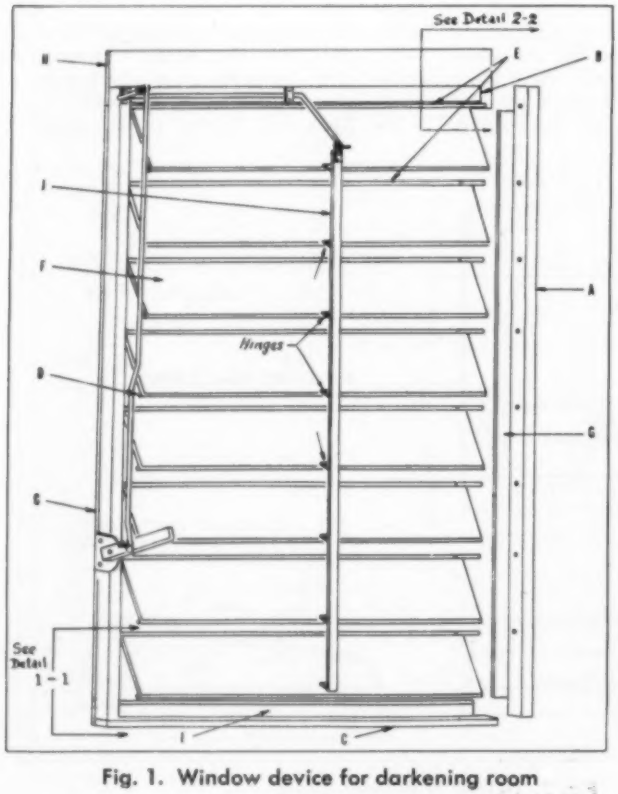


Fig. 1. Window device for darkening room

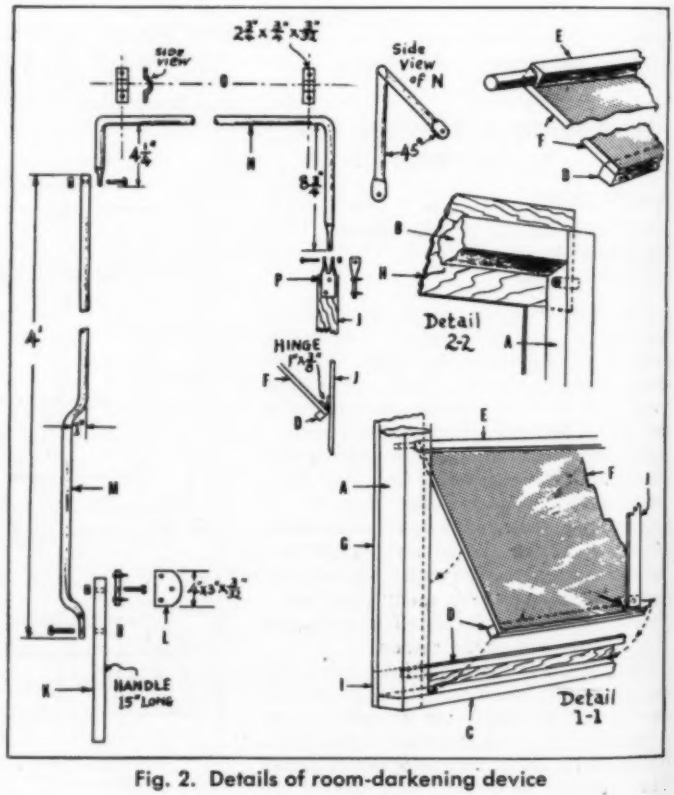


Fig. 2. Details of room-darkening device

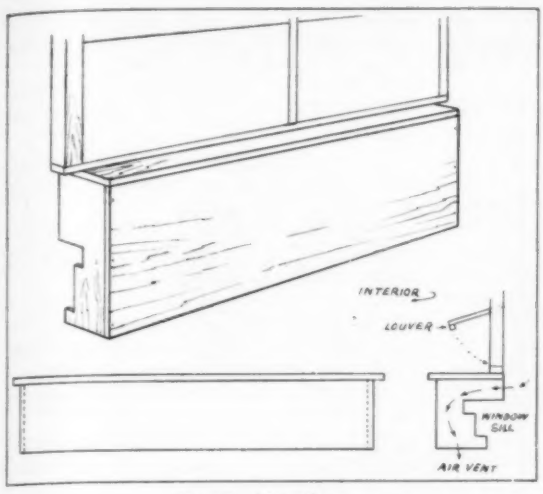


Fig. 3. Ventilator

dows, it may be necessary to construct ventilators to fit below the window devices. Figure 3 shows one type which has been used successfully. Dimensions have not been given as they vary for individual installations, and are therefore left to the discretion of the user. It may be necessary to change the length of the window device if large ventilators are installed.

BILL OF MATERIALS FOR 65 BY 35-IN. WINDOW

No. of pcs.	Part	Name	Material	Size
2	A		White pine	1¼ x 1¼ x 64¼ in.
1	B		White pine	1¼ x 1¾ x 34 7/16 in.
1	C		White pine	1¼ x ½ x 36 7/8 in.
9	D		White pine	5/16 x 7/16 x 34 3/16 in.
8	E		White pine	½ x ½ x 36 in.
8	F		Masonite	3/16 x 8 5/8 x 34 3/16 in.
2	G		Plywood	2 3/8 x 3/8 x 60½ in.
1	H		Plywood	2 3/8 x 3/8 x 36 7/8 in.
1	I		Plywood	1½ x 3/8 x 36 7/8 in.
1	J		Plywood	3/8 x 7/8 x 54 in.
1	K	Handle	Wood or tubing	½-in. round metal
1	L	Handle plate	Metal	3 x 4 x 3/32 in.
1	M	Elevating rod	made from ½ by 118-in. round brass	
1	N	Elevating lever	made from ½ by 118-in. round brass	
2	O	Half round clamps		
1	P	Special hinge	3 by 3/4 by 3/23 in.	
8		Hinges		1 x 3/8 in.
4		Bolts		3/16 x 1½ in.
6		Screws		No. 9 by 1 in.
10		Screws		No. 5 by 3/8 in.
8		Screws		No. 5 by ½ in.

AN EXPERIMENT WITH TELEVISION

CLIFFORD L. YARD
Instructor, Industrial Arts Department
State Teachers College
Millersville, Pa.

On October 17 the industrial-arts department of the Millersville State Teachers College inaugurated a 15-minute weekly television program over WGAL-TV (Lancaster, Pa.) entitled "What Do You Want to Know?" Miss Phyllis Dick, a 1949 graduate of the industrial-arts department, started the series off with her presentation of the timely subject "How to Make Halloween Masks." Professor Paul Eshelman gave a demonstration on "Making a Leather Bag" for the second program. The accompanying picture was taken of the third program showing, from left to right, Nelson Sears of the broadcasting station at the camera, Dr. Burl N. Osburn, director of industrial arts, demonstrating the art of cutting linoleum blocks and printing Christmas cards, and Professor George Anderson of the mathematics department acting as master of ceremonies. Professor Anderson is *general engineer* of the whole program.

Dr. Burl Osburn and Professor George Anderson being televised by Nelson Sears of the broadcasting station

Plans for other programs to be presented by students and faculty members of the industrial-arts department include: "Working With Plastics," "Silversmithing," "Drawing Is Fun," "Flocking for Decoration," "Making Pottery," and "Jewelry Making." Present tentative plans also include programs from other departments of the college such as the mathematics department, the science department, etc.

Edward J. Reinhardt, shop instructor, gives some advice to a student working on a model to be submitted in the Fisher Body Craftsman's Guild contest

FEELINGS THAT RETARD THE STUDENT

HOMER C. ROSE
Curriculum and Instructor Training Section
Navy Department, Bureau of Naval Personnel
Washington, D. C.

Fear and Worry

1. Fear of failure.
2. Fear of ridicule from class or instructor.
3. Family and home problems.
4. Fear of sickness.
5. Worry over money.

Discomfort

1. Standing too long.
2. Eyestrain.
3. Improper living habits.
4. Dirty working conditions.
5. Dangerous tools and equipment.
6. Poor ventilation.

Being Bored

1. Instructor talks too long at a time.
2. Little chance to use equipment.
3. Instructor not prepared.
4. Training aids not used.
5. Training methods not adjusted to the ability of the class.

WOODSHOP MACHINERY AND SAFETY

LOUIS BAROCCI
High School
Cudahy, Wis.

Many woodshops are equipped with power machines with saws, cutters, knives, belts, etc., traveling at high speed. In the operation of these machines, both the teacher and the student ought to observe all the rules of safety.

The following rules governing the use of power machines have been drawn from several publications.[1]

The Circular Saw

"Guards: Undoubtedly, no machine is so useful in the woodshop as the circular saw, because of the great variety of operations that it makes possible. Like all machines with high speed revolving cutters, however, it is very dangerous, unless properly guarded and judiciously used. Every precaution should be taken to avoid accidents.

"Always use a splitter or spreader guard in connection with a ripsaw to prevent the stock from pinching the saw blade, climbing the up-going teeth and being thrown. The splitter also guards the hands of an operator reaching back of the saw, protects an off-bearer and prevents edgings being caught and thrown."[2]

Safety Rules

1. Don't hang the saw guard on the wall. Use it. Use some type of guard to protect the worker from the saw whenever the nature of the work will permit.
2. Don't take the splitter off the ripsaw in any event. It is the most important guard on the saw bench.
3. Don't allow the saw to project more than ⅛ in. above the stock to be cut. More than this invites unnecessary danger.
4. Don't stand directly behind or in line with a circular saw when it is in operation, but rather to the left or right, because the force of a piece thrown back could cause serious injury.
5. Avoid reaching over a revolving saw for anything. Have an assistant to "tail" the machine when necessary.
6. Avoid wearing loose clothing, and have the sleeves rolled above the elbows. Take the necktie off, or tuck it securely within the shirt.
7. Use a push stick for all narrow ripping between the fence and the saw. Short length stock should be carefully drawn, after sawing slightly more than halfway through from one end, and the cut completed by reversing the piece, end for end, keeping the same edge against the fence.
8. At no time do either rippings or crosscutting without holding the stock either against a ripping fence or a cutoff gauge.
9. Rip no stock unless at least one edge is straight and quite free from roughness or projections, and place that edge against the ripping fence. In fact, it is best to joint one edge before ripping. Curved or irregular edges may cause binding and possible accidents.
10. Do no crosscutting of narrow stock, using ripping fence as a right hand stop, unless you use clearance block attached to face of fence at front end.
11. See that all adjustments on machine are tightened and gauges and attachments fastened in position by means of the pins and clamping screw provided for that purpose.
12. Don't change the saws without first opening the switch or starter. Better yet, remove the fuses on that particular circuit in the cutout cabinet or wall panel, especially when the machine is down for repairs.
13. Avoid using a dull saw or one that does not have a proper set. Using either will overheat the saw causing it to warp and wobble, injure the saw teeth and the table, and often so frighten an operator that an accident is caused. When a saw wobbles, do not shut off the power, but remove the stock quickly, permit the saw to straighten out by centrifugal force, and cool off. Generally, burned or wobbly saws ought to be returned to the factory for hammering or retempering.
14. Don't clean saw tables with your hands — use a stick.
15. Don't let dirt or scraps accumulate around the machine. Keep it clean at all times, so that no one may slip or be hurt by stepping on sawdust, grease, etc.
16. Don't look around while operating the machine. Keep your eyes on your job and your fingers on your hand.
17. All setups, other than straight work, must be checked and approved by the instructor.
18. When helping to "tail-off," never pull on the wood; just support it and allow the operator to feed and guide the stock.
19. Dado heads are dangerous, in that a wider tearing surface is exposed; therefore, extra precautions are necessary to prevent the stock from "riding" back over the cutters.
20. Any saw that "wobbles" is dangerous. Do not use it.
21. Do not attempt to straighten a warped or lump saw unless you have had special training in that kind of work.
22. When filing gullets, see that they are all nicely rounded to prevent cracks.
23. Replace any saw in which even a slight crack appears. "Doctoring" it by drilling may prove dangerous.
24. Never leave the saw with power turned on.[3]

Operating Speeds for Circular Saws Maximum Safe Operating Speeds

"Table I gives the maximum permissible speeds in revolutions per minute for various sizes of circular saws, and has been taken from the National Safety Code for Woodworking Plants. For ordinary operations, the speeds given in column *A* should not be exceeded. Where high speed saw blades are used, speeds not to exceed those given in column *B* may be used as recommended by the manufacturer."[4]

TABLE 1. Revolutions Per Minute

Diameter of Saw	*Column A Blades for Operating at Ordinary Speeds*	*Column B Blades for Operating at High Speeds*
8 in.	7200	9000
10 in.	5760	7100
12 in.	4800	6000
14 in.	4110	5100
16 in.	3600	4450
18 in.	3200	4000
20 in.	2800	3600
22 in.	2620	3300
24 in.	2400	3000
26 in.	2220	2750
28 in.	2060	2570
30 in.	1920	2400
32 in.	1800	2250
34 in.	1690	2100
36 in.	1600	2000
40 in.	1440	1800
44 in.	1310	1640
48 in.	1200	1500
54 in.	1070	1310
60 in.	960	1200

The Swing Cutoff Saw

1. Never attempt to use this saw for sawing short pieces of work.

[1] *Installation, Care, and Operation of Circular Saw Benches*, Oliver Machinery Company, Grand Rapids, Mich., n.d., pp. 16–17; *Manual of Safety Instruction for Vocational and Industrial Arts*, The Fine Arts Press, Santa Ana Senior High School, 1937; *Proper Installation and Care of Band Saws*, Oliver Machinery Company, Grand Rapids, Mich., n.d.

[2] *Installation, Care, and Operation of Circular Saw Benches*, Oliver Machinery Company, Grand Rapids, Mich., p. 16.

[3] *Ibid.*, n.d., pp. 16–17.

[4] Safety Instruction Card 254, National Safety Council, Chicago, Ill.

(Continued on page 19A)

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WOODSHOP MACHINERY AND SAFETY

(Contiuued from page 138)

2. Don't use the saw if it is dull. Replace it with a sharp saw.
3. Make all setups before starting the saw.
4. Be sure that the stock is firmly against the fence when cutting.
5. Never force the saw any faster than it can cut.
6. When cutting warped stock, feed the saw slowly to avoid pinching.
7. The operator must keep his hands away from the saw track at all times.
8. Do not remove scraps of lumber with your fingers while the saw is in operation.
9. Turn the power off when you have finished sawing.

The Band Saw

1. Determine the proper cutting procedure before turning on the power.
2. Make all necessary adjustments before starting the saw. Keep the upper guide as close to the stock as possible.
3. Do not start to cut until the saw has attained maximum speed, or do not cut after the power has been shut off.
4. Never attempt to back out for any great distance. You might pull the saw off the wheels. If backing out is necessary, stop the machine.
5. See your way out before starting the cut.
6. Never reach back of the saw to pull the stock through.
7. Cylindrical stock must never be cut on the band saw, as it tends to roll. This may cause the saw to break or pull the fingers into the saw.
8. Never stand at right or left side of the saw, for in the event of a break, the saw may hurl out.
9. Learn to cultivate finger tip control of the stock.
10. Be careful when sawing sharp corners or small curves, as the saw may become jammed in a tight place or be given an unnatural twist. Lack of care may cause a crack or break.
11. Always replace the guide when sawing an unusually thick piece of wood or doing other work requiring the raising of the guide. If the guide is a few inches too high, the saw will be easily broken.
12. If a saw coats over on the sides with the gum or pitch in the wood, clean it immediately with kerosene oil; failure to do this will spoil the clearance, increase the working strain, and generate heat.
13. Uneven teeth cause a sharp tremor of the saw. To avoid breaking the saw check it as soon as a tremor is apparent.
14. Overfeeding or crowding the saw beyond its capacity will cause inaccurate work and break the saw.
15. A worn table block in which the saw opening has become so large as to allow the passage of large chips to the lower wheel should be immediately replaced. Were these chips to be carried around between the saw and the surface of the wheel, the blade would be stretched and weakened.

COMPLETE OR PARTIAL INSTALLATION BACKED BY YEARS OF "KNOW-HOW"

Whether your requirement is a few additional pieces of furniture or fully equipped new departments . . . laboratories, homemaking, art, vocational or industrial shops . . . Sheldon provides standard and modified units that are outstanding for excellence of design and construction . . . qualities that long and hard usage only serve to emphasize. In experience and facilities, Sheldon is unsurpassed; and Sheldon's record of customer satisfaction is unique.

Look TO SHELDON For LEADERSHIP!

IT'S THE DETAILS THAT MAKE THE DIFFERENCE

Whether of wood or metal, Sheldon furniture is soundly engineered and carefully constructed. Drawers and doors continue to function properly despite hard usage. Drawers are equipped to receive partitions that are easily arranged and rearranged to accommodate contents for orderly storage and to prevent breakage . . . Just one more example of Sheldon's thoroughness in detail.

The key to your complete equipment problem

E. H. Sheldon & COMPANY
MUSKEGON, MICHIGAN

The Jointer

1. The guard must always be in place and in functioning condition.
2. The student should make no adjustments except under the immediate supervision of the instructor.
3. Be on the lookout for knots and split stock.
4. Run no stock less than 10 in. in length, over the machine.
5. Always use a pusher for face jointing.
6. Joint no stock less than 1 in. in width, or less than ½ in. in thickness.
7. Never run end grain over the jointer.
8. Follow through with the stock, and allow the guard to return to the closed position.
9. Be careful that fingers do not slip off the stock, and never drag the thumb at the rear of the board.
10. Insist that guards be provided for both sides of the fence.
11. Check all new knives carefully before you turn on the power.
12. Remember that "kickbacks" occur when the cut is too deep, or when the blade strikes knots.

The Wood Lathe

1. Keep the tool post as close to the work as possible, and make frequent follow-up adjustments.

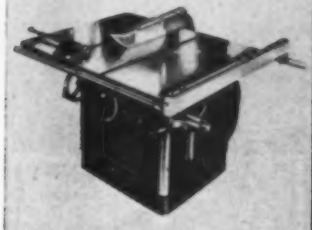
(Continued on page 22A)

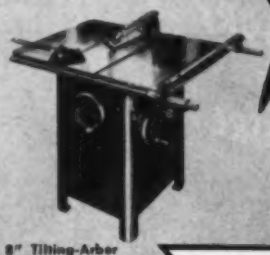
DELTA's complete quality line has

DELTA
MILWAUKEE
®

Saw Jointer Combination
2 models

10" Tilting-Arbor Saw
2 varieties


12" Tilting-Arbor Saw
6 varieties


8" Tilting-Arbor Saw
2 varieties

Delta Multiplex
40A

Tool Grinder
with Twin-Lite® Safety Shields
18 varieties

Belt Sander
2 varieties

Disk Sander
3 models
4 varieties

Mortiser

Wood Lathe
2 varieties

6" Jointer
2 varieties

8"-12" Jointer

24" Scroll Saw
2 varieties

Combination Spot
and Arc Welder
2 varieties

Toolmaker®
Surface Grinder

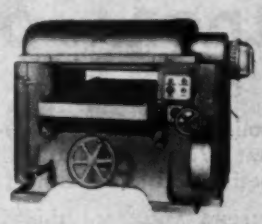
20" Band Saw
2 varieties

36" Band Saw
3 varieties

14" Band Saw
4 varieties

- Delta-Milwaukee® Machine Tools
- Delta® Multiplex Radial Arm Saws
- Crescent Woodworking Machines

the right machines for your program and budget



P-24 Planer

14" Drill Press
2 models — 20 varieties

17" Drill Press
2 models — 16 varieties

Cabinet Shaper

53 machines!...246 varieties!

The Delta line has the machines you need. It's the most complete line available — the only line with complete accessories to make every machine more useful.

What's more, Delta machines are ideal for the school shop, too: They are safe and easy to operate. They are economical to buy and operate. They are compact, occupy little floor space. Their height is convenient for students.

Industry wants people trained on Delta machines. For they are machines that are used by practically every branch of American industry.

Investigate further the advantages of the metalworking and woodworking machines in the broad Delta line. See them now at your nearby Delta distributor.

Send coupon below for facts on every machine in the entire Delta line — and for a free copy of "How to Plan a School Workshop."

Look for the name of your Delta distributor under "Tools" in the classified section of your telephone directory.

Sold only through authorized dealers.
Available on deferred payments to fit your budget.

These typical quality features insure long life, continued accuracy, and low maintenance costs!

Lubricated-for-life Ball Bearings. Never need oiling—they're lubricated for life before they leave the factory. Double-sealing keeps dirt out, lubricant in.

Precision-bored Bearing Seats. Perfectly round, true to size, correctly positioned, properly aligned. Bearings fit closely, are tightly held, cannot become loose.

Pre-loaded Bearings. An extra manufacturing operation removes "end play." This provides maximum rigidity and accuracy under load and increases bearing life.

Precision-ground Shafts. All spindles, arbors, and collars are ground for accuracy, to provide full, even contact between shaft and bearing, assure accuracy.

Dynamically-balanced Pulleys. All pulleys which rotate at high speed are dynamically balanced to help eliminate damaging vibration.

Tear out coupon and mail today!

Power Tool Division
ROCKWELL MANUFACTURING CO.
702 E. Vienna Ave., Milwaukee 1, Wis.

Send me free catalogs and bulletins on the complete Delta quality line—also booklet, "How to Plan a School Workshop."

Name_____

Position_____

School_____

Address_____

City_____ ( ) State_____

POWER TOOL DIVISION
Rockwell
Manufacturing Company
MILWAUKEE 1, WISCONSIN

8-49

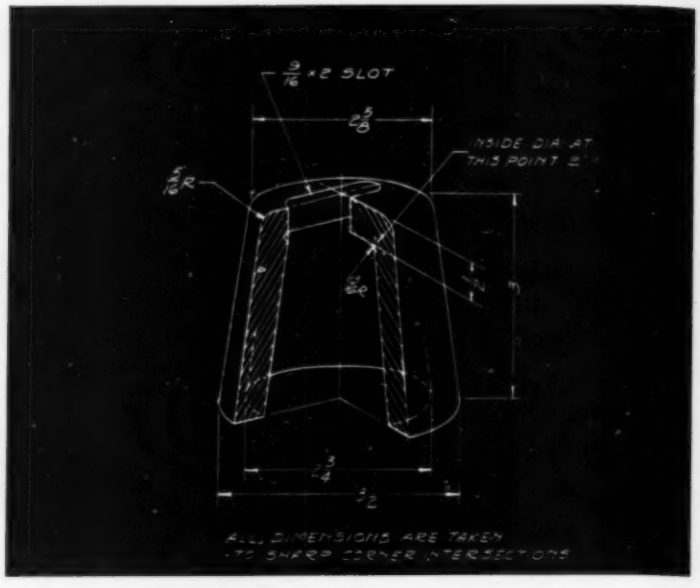
YOUR MARCH ELDORADOSTAT . . .

Guard rail cable support

We believe you'll find this one of the best Eldoradostat Problems and Solutions — especially instructive and stimulating for your students.

We'll send you *free* this Eldoradostat of both problem and solution. From it you can make as many blueprints as you need for classroom distribution.

Many thousands of instructors have been using these Eldoradostats regularly since 1939. Needless to say, we have always kept our "*Eldoradostate* of mind"— a really satisfying sense of knowing our service is being helpful — and a deep pride in having so many vocational educators say they get their best results with the pencil that makes this service possible — Dixon Typhonite ELDORADO.



If you are not already receiving these problems, write to the address below and your name will be placed on our mailing list.

DIXON'S *TYPHONITE* ELDORADO

SCHOOL BUREAU, PENCIL SALES DEPT., 128-J3, JOSEPH DIXON CRUCIBLE CO., JERSEY CITY 3, N. J.

WOODSHOP MACHINERY AND SAFETY

(Continued from page 19A)

2. Turn on the power only after making sure that the material to be turned is held securely.

3. Hold your tools securely in your hands.

4. Never put your hand around revolving pieces to see whether they are round.

5. Remove your necktie. Keep hair combed back. If necessary, wear a skullcap.

6. Beware of dangling sleeves, etc.

7. Ask the instructor for the proper speed for each job.

8. Be sure that glued work has been set properly and securely.

9. Use only sharp tools for safety and for good work. (With sharp tools less grip will be necessary.)

10. Never use the gouge for inside turning.

11. Examine stock for dangerous splits, checks, and knots.

12. Hold the tool firmly in both hands.

13. Stop the lathe for calipering and measuring unless the stock is absolutely round.

14. Do not shut off faceplate jobs too suddenly; they may back off the spindle.

15. Do not attempt to slow down the machine by grasping the stock. You may be injured.

16. Beware of polishing rags. The loose ends may catch in the stock and pull the operator against the revolving stock.

The Planer

1. Measure stock accurately before setting the bed for the first cut. Ordinarily, do not take more than one eighth of an inch cut, and on wide surfaces, not more than one sixteenth of an inch cut.

2. Do not plane stock that is less than ¼ in. in thickness. A support board is dangerous for planing thin stock.

3. Do not run stock that is less than 12 in. in length through the thickness planer.

4. Do not allow edge planing where tilting cannot be prevented.

5. Double check for security when new knives have been installed before turning on power.

6. Remember that "kickbacks" occur when the stock is smaller than the feed roll opening and the board is struck directly against the revolving cutter head.

7. Never forget that lumber passing through the planer must be free of loose knots.

8. Always stand at one side of the planer. Never look between the feed rolls while the machine is in operation.

The Mortiser

1. Provide the mortising machine with thumb stops in order that the hands of the operator may not come in contact with the chisel.

2. Clamp stock firmly in the machine before starting to cut a mortise.

3. When mortising, do not move the table until the bit has been lifted clear of the mortise.

4. Make certain the spindle sleeves are properly in place and that the setscrews have been tightened.

5. Before turning on the power, adjust the down travel so that the bit does not hit the table at the bottom of the stroke.

The Disk and Spindle Sander

1. Sand stock only on the downward travel of the disk.

2. Before using the table of the disk and drum sander, make certain that it has been securely fastened.

3. When sanding small pieces of stock on the spindle sander, be especially careful that the fingers do not get caught between the oscillating spindle and the table.

The Wood Shapers

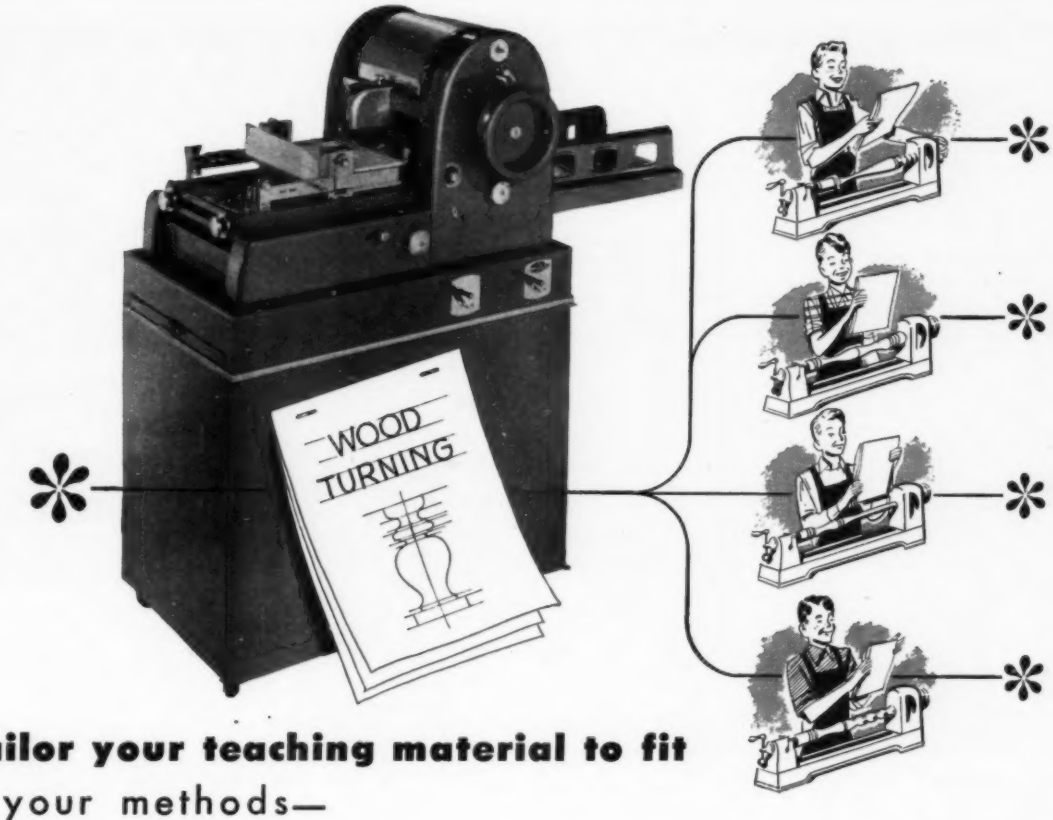
1. Do not operate a shaper unless you are experienced in the work and specifically authorized to do so.

2. Wear close-fitting clothing — no loose sleeves, or neckties, or gloves.

3. Make sure that all guards are in place and operative.

4. Use extra caution when setting and belting knives. Short, unbalanced, or loose knives are dangerous.

(Continued on page 30A)



tailor your teaching material to fit

your methods—
your students—
your facilities—

First you develop exactly the teaching material you need to fit your methods and circumstances. Then you simply mimeograph enough sight-saving black-on-white copies to give every student a personal copy.

Mimeographing today is surprisingly quick, easy and economical. Anything drawn, written or typed is reproduced in a matter of minutes. Mimeograph enough copies to fill your immediate need, then file the stencil for re-use.

The complete line of A. B. Dick precision drawing instruments for stencils will make your work easier and more effective. The new illuminated drawing board gives you all the accuracy of a drafting board. There's a new, wider line of mimeograph styli, lettering guides and shading screen plates plus a complete line of stencils designed to meet every need. For complete information, phone your local A. B. Dick distributor or mail the coupon below.

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Please send me ☐ catalog on the new A. B. Dick illuminated drawing board ☐ catalog on the new precision drawing instruments for stencils ☐ information on the new A. B. Dick mimeographs.

Name.....*Position*.....

School.....

Address.....

City.....*Zone*....*State*.....

Metalworking Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

AIR COMPRESSORS — for machine shop, foundry, or forge shop
ANVIL — 100 lb.
ARBOR PRESS — bench or pedestal type
BARROWS
- a) Coke
- b) Foundry
- c) Scrap

BELT LACER
BENCHES
- a) Coremaking
- b) For metal working, iron or steel legs. Tops, metal or hardwood lumber, 1¾ in. to 2½ in. thick
- c) Molding

BLACKBOARD — permanent or portable
BLOWERS — for furnaces, forges, etc.
BLOWTORCH — 1-qt. size
BOOKCASE — for reference books, catalogs, etc.
BORING BAR
BORING MILL — vertical or horizontal
BULLETIN BOARD
CABINETS — Wood or metal, for filing class records, instruction sheets, drawings, etc., and for tools and supplies
CASEHARDENING BOXES
CENTERING MACHINE
CHAIN HOISTS — differential, duplex or triplex
CHAIRS — teacher's, and tablet arm if needed for related-subjects room, or for demonstration section
CHUCK
- a) Drill, selected sizes
- b) Lathe, combination, 4 jaw, selected sizes
- c) Lathe, independent, 4 jaw, selected sizes
- d) Lathe, universal 3 jaw, selected sizes
- e) Milling machine, universal

CORE OVEN — for foundry
CRANES AND HOISTS — air, electric, or hand, of the jib, traveling, or portable type
CUPOLA — for foundry, coke, or electric, ¼- to 1-ton capacity
DESK — teacher's, with drawer compartments
DIE-FILING MACHINE
DIVIDING HEAD
DRILLS
- a) Bench, hand
- b) Breast
- c) Electric, portable
- d) Hand
- e) Post, hand or power
- f) Radial
- g) Sensitive
- h) Upright, power

FLASKS — 2 or 3 part, steel or snap type
FORGE — coal or gas, with hand- or electric-driven blower
FURNACES
- a) Annealing
- b) Bench
- c) Brass and soft metal
- d) Combination bench
- e) Casehardening
- f) Cyanide
- g) Gasoline
- h) Heat-treating
- j) Melting

GEAR-CUTTING MACHINE
GRINDER
- a) Bench, hand or power driven
- b) Combination grinder, buffer, and polisher
- c) Emery, bench or pedestal type
- d) Face, with magnetic chuck
- e) Portable tool post
- f) Precision, for external and internal grinding
- g) Universal tool cutter, drill and reamer grinder
- h) Wet tool

HACK SAW — motor or belt driven
HAND PICKS — for cleaning inside of cupola, 1¼ to 2½ lb.
HARDNESS TESTING MACHINE
LATHES — belt or individual drives
- a) Automatic
- b) Bench, 6-in. to 11-in. swing, 11 in. to 36 in. between centers
- c) Change gear, 9-in. to 14-in. swing, 18 in. to 36 in. between centers
- d) Quick-change gear, 9-in. to 16-in. swing, 18 in. to 36 in. between centers
- e) Semiquick-change gear, 9-in. to 18-in. swing, 18 in. to 42 in. between centers
- f) Turret
- g) Metal spinning

MILLING MACHINE
- a) Plain, cone or motor-driven type
- b) Universal, cone or motor-driven type

NIBBLING MACHINE
PIPE CUTTER
PLANER — belt or motor driven
POWER HAMMER — for forging operations
PUNCHES — metal, hand, or power
PYROMETER
PYROSCOPE
RELIEVING ATTACHMENT FOR LATHE
SAND SIFTER — for foundry, hand or power
SANDBLAST OUTFIT — with cabinet
SCALE
- a) Counter for machine shop
- b) Platform, for foundry, 1000-lb. capacity

SHAPER
SNAP-FLASK JACKETS — to fit snap flasks used
STRAIGHTENING PRESS
SURFACE PLATES
SWAGE BLOCK AND STAND — for forge shop
TAPER ATTACHMENT FOR LATHE
TRUCK — warehouse
TUMBLING BARREL — for foundry
VISES
- a) Blacksmith
- b) Drill press
- c) Machinist
- d) Pipe
- e) Planer
- f) Shaper

WELDING OUTFIT
- a) Acetylene
- b) Electric

Metalworking—Small Tools

ARBORS
- a) Drill chuck to suit requirements
- b) Reamers, various sizes
- c) Shell tool, various sizes
- d) Straight shank for shell reamers and shell drills, selected sizes
- e) Taper shank for shell reamers and shell drills, selected sizes

BEARING SCRAPER
BELLOWS — for foundry class
BEVEL PROTRACTOR
BROOMS AND FLOOR BRUSHES — for shop and foundry
BRUSHES
- a) Bench
- b) Core box
- c) Core painting
- d) Hard brushes for foundry
- e) Floor
- f) Soft brushes for foundry

BULB SPONGES — for molders
DRAW PINS — for molders
CALIPERS
- a) Hermaphrodite, 4 in. and 6 in.
- b) Inside, 4 in. and 6 in.
- c) Outside, 4 in. and 6 in.

CANS
- a) Oil, 1/3 pt., 1 pt., and 10 gal.
- b) Waste

CENTER TESTERS
CHISELS
- a) Cape, 3/8 in. and 5/8 in.
- b) Cold, 5/8 in. and ¾ in.
- c) Diamond point, 3/8 in. and ½ in.
- d) Roundnose, 3/8 in. and ½ in.

CLAMPS
- a) 4 in., 6 in., 8 in., and 10 in.
- b) Flask, for foundry
- c) Strap, various sizes

CAKE FORKS — for foundry
COLLETS
- a) For milling machine, selected sizes
- b) For lathe, selected sizes

COMBINATION SQUARES—with hardened head and blade, and protractor head, 9 in. and 12 in.
COUNTERBORES — straight and tapered shanks, selected sizes
COUNTERSINKS — for metal
CRUCIBLE TONGS — to fit crucibles
CRUCIBLES — selected sizes
- a) Shanks, single end to fit ladles
- b) Shanks, hand, to fit ladle bowls

CUTTERS — angular milling, bevel gear, concave milling, convex milling, end milling, face milling, formed milling, grooving, involute gear teeth, key seat, side milling, and metal slitting

DIVIDERS — Spring, 4 in. and 6 in.
DRILLS
- a) Drifts, different sizes
- b) Sleeves, different sizes
- c) Stand for Nos. 1 to 60
- d) Stand for 1/16 in. to ½ in. by 64ths

DRILLS
- a) Center
- b) High speed, taper shank, various sizes
- c) Jobbers, straight shank, 1/16 in. to ½ in. by 64ths
- d) Ratchet
- e) Straight shank, Nos. 1 to 60
- f) Taper shank, ½ in. to 1 in. by 16ths

FILE CARDS
FILES
- a) Die sinkers, various shapes
- b) Flat bastard, 8 in., 10 in., 12 in., and 14 in.
- c) Half round, double cut, 6 in., 8 in., 10 in., and 12 in.
- d) Hand, smooth, 8 in., 10 in., and 12 in.
- e) Mill, smooth, 8 in., 10 in., and 12 in.
- f) Round bastard, 8 in., and 10 in.
- g) Square bastard, 8 in., and 10 in.
- h) Swiss, various shapes
- j) Three-square, double cut, 6 in.
- k) Warding, double cut, 6 in.

FIRST-AID CABINET AND SUPPLIES
FORGE TOOLS — drift pins, flatters, fullers, hand and handle punches, hardies, hot and cold cutters, set hammers, and swages for the forge shop
GATE STICKS — maple, for foundry
GAUGES
- a) Center
- b) Depth
- c) Drill and wire
- d) Screw pitch, select kinds
- e) Surface
- f) Thickness

GLOVES — asbestos, for foundry
GOGGLES
- a) For machine shop
- b) For foundry

HACK SAW
- a) Blades, hand, 18T, 10 in.

(Continued on page 26A)

TRAIN YOUR BOYS on the machines they will use in industry

CINCINNATI No. 2ML Universal Milling Machine, catalog M-1662.

CINCINNATI 8" x 18" Tool and Die Milling Machine, catalog M-1620.

Training your boys on machines built for industry gives them the confidence they will need when they're "on their own." Several CINCINNATI machines that will be seen by your graduates wherever they go are suitable for vocational schools. Four of them are shown here. 1. CINCINNATI No. 2ML Milling Machine ... for a variety of milling work, from cutting helical gear teeth to boring holes with fly cutters. 2. CINCINNATI No. 2 Cutter and Tool Grinder ... for sharpening most of the cutters used in the average shop; milling cutters, planer tools, reamers, taps, etc. 3. CINCINNATI 8" x 18" Tool and Die Milling Machine ... for making small dies and molds; for a variety of light milling operations. 4. CINCINNATI 12" Hydraulic Universal Grinding Machine ... for all the variations of external grinding (straight cylindrical, taper, bevel, face), and for internal grinding. All these machines are safe and ruggedly built to withstand uncertain handling by students. You may obtain complete information by writing for the literature specified under the illustrations.

CINCINNATI 12" Hydraulic Universal Grinding Machine, catalog G-486-5.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI GRINDERS INCORPORATED

Metalworking Equipment, Tools, and Supplies

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BELT LACER
BENCHES
- a) Coremaking
- b) For metal working, iron or steel legs. Tops, metal or hardwood lumber, 1¾ in. to 2½ in. thick
- c) Molding

BLACKBOARD — permanent or portable
BLOWERS — for furnaces, forges, etc.
BLOWTORCH — 1-qt. size
BOOKCASE — for reference books, catalogs, etc.
BORING BAR
BORING MILL — vertical or horizontal
BULLETIN BOARD
CABINETS — Wood or metal, for filing class records, instruction sheets, drawings, etc., and for tools and supplies
CASEHARDENING BOXES
CENTERING MACHINE
CHAIN HOISTS — differential, duplex or triplex
CHAIRS — teacher's, and tablet arm if needed for related-subjects room, or for demonstration section
CHUCK
- a) Drill, selected sizes
- b) Lathe, combination, 4 jaw, selected sizes
- c) Lathe, independent, 4 jaw, selected sizes
- d) Lathe, universal 3 jaw, selected sizes
- e) Milling machine, universal

CORE OVEN — for foundry
CRANES AND HOISTS — air, electric, or hand, of the jib, traveling, or portable type
CUPOLA — for foundry, coke, or electric, ¼- to 1-ton capacity
DESK — teacher's, with drawer compartments
DIE-FILING MACHINE
DIVIDING HEAD
DRILLS
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- b) Breast
- c) Electric, portable
- d) Hand
- e) Post, hand or power
- f) Radial
- g) Sensitive
- h) Upright, power

FLASKS — 2 or 3 part, steel or snap type
FORGE — coal or gas, with hand- or electric-driven blower
FURNACES
- a) Annealing
- b) Bench
- c) Brass and soft metal
- d) Combination bench
- e) Casehardening
- f) Cyanide
- g) Gasoline
- h) Heat-treating
- j) Melting

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- c) Change gear, 9-in. to 14-in. swing, 18 in. to 36 in. between centers
- d) Quick-change gear, 9-in. to 16-in. swing, 18 in. to 36 in. between centers
- e) Semiquick-change gear, 9-in. to 18-in. swing, 18 in. to 42 in. between centers
- f) Turret
- g) Metal spinning

MILLING MACHINE
- a) Plain, cone or motor-driven type
- b) Universal, cone or motor-driven type

NIBBLING MACHINE
PIPE CUTTER
PLANER — belt or motor driven
POWER HAMMER — for forging operations
PUNCHES — metal, hand, or power
PYROMETER
PYROSCOPE
RELIEVING ATTACHMENT FOR LATHE
SAND SIFTER — for foundry, hand or power
SANDBLAST OUTFIT — with cabinet
SCALE
- a) Counter for machine shop
- b) Platform, for foundry, 1000-lb. capacity

SHAPER
SNAP-FLASK JACKETS — to fit snap flasks used
STRAIGHTENING PRESS
SURFACE PLATES
SWAGE BLOCK AND STAND — for forge shop
TAPER ATTACHMENT FOR LATHE
TRUCK — warehouse
TUMBLING BARREL — for foundry
VISES
- a) Blacksmith
- b) Drill press
- c) Machinist
- d) Pipe
- e) Planer
- f) Shaper

WELDING OUTFIT
- a) Acetylene
- b) Electric

Metalworking—Small Tools

ARBORS
- a) Drill chuck to suit requirements
- b) Reamers, various sizes
- c) Shell tool, various sizes
- d) Straight shank for shell reamers and shell drills, selected sizes
- e) Taper shank for shell reamers and shell drills, selected sizes

BEARING SCRAPER
BELLOWS — for foundry class
BEVEL PROTRACTOR
BROOMS AND FLOOR BRUSHES — for shop and foundry
BRUSHES
- a) Bench
- b) Core box
- c) Core painting
- d) Hard brushes for foundry
- e) Floor
- f) Soft brushes for foundry

BULB SPONGES — for molders
DRAW PINS — for molders
CALIPERS
- a) Hermaphrodite, 4 in. and 6 in.
- b) Inside, 4 in. and 6 in.
- c) Outside, 4 in. and 6 in.

CANS
- a) Oil, 1/3 pt., 1 pt., and 10 gal.
- b) Waste

CENTER TESTERS
CHISELS
- a) Cape, 3/8 in. and 5/8 in.
- b) Cold, 5/8 in. and 3/4 in.
- c) Diamond point, 3/8 in. and 1/2 in.
- d) Roundnose, 3/8 in. and 1/2 in.

CLAMPS
- a) 4 in., 6 in., 8 in., and 10 in.
- b) Flask, for foundry
- c) Strap, various sizes

CAKE FORKS — for foundry
COLLETS
- a) For milling machine, selected sizes
- b) For lathe, selected sizes

COMBINATION SQUARES—with hardened head and blade, and protractor head, 9 in. and 12 in.
COUNTERBORES — straight and tapered shanks, selected sizes
COUNTERSINKS — for metal
CRUCIBLE TONGS — to fit crucibles
CRUCIBLES — selected sizes
- a) Shanks, single end to fit ladles
- b) Shanks, hand, to fit ladle bowls

CUTTERS — angular milling, bevel gear, concave milling, convex milling, end milling, face milling, formed milling, grooving, involute gear teeth, key seat, side milling, and metal slitting
DIVIDERS — Spring, 4 in. and 6 in.
DRILLS
- a) Drifts, different sizes
- b) Sleeves, different sizes
- c) Stand for Nos. 1 to 60
- d) Stand for 1/16 in. to 1/2 in. by 64ths

DRILLS
- a) Center
- b) High speed, taper shank, various sizes
- c) Jobbers, straight shank, 1/16 in. to 1/2 in. by 64ths
- d) Ratchet
- e) Straight shank, Nos. 1 to 60
- f) Taper shank, 1/2 in. to 1 in. by 16ths

FILE CARDS
FILES
- a) Die sinkers, various shapes
- b) Flat bastard, 8 in., 10 in., 12 in., and 14 in.
- c) Half round, double cut, 6 in., 8 in., 10 in., and 12 in.
- d) Hand, smooth, 8 in., 10 in., and 12 in.
- e) Mill, smooth, 8 in., 10 in., and 12 in.
- f) Round bastard, 8 in., and 10 in.
- g) Square bastard, 8 in., and 10 in.
- h) Swiss, various shapes
- j) Three-square, double cut, 6 in.
- k) Warding, double cut, 6 in.

FIRST-AID CABINET AND SUPPLIES
FORGE TOOLS — drift pins, flatters, fullers, hand and handle punches, hardies, hot and cold cutters, set hammers, and swages for the forge shop
GATE STICKS — maple, for foundry
GAUGES
- a) Center
- b) Depth
- c) Drill and wire
- d) Screw pitch, select kinds
- e) Surface
- f) Thickness

GLOVES — asbestos, for foundry
GOGGLES
- a) For machine shop
- b) For foundry

HACK SAW
- a) Blades, hand, 18T, 10 in.

(Continued on page 26A)

TRAIN YOUR BOYS on the machines they will use in industry

CINCINNATI No. 2ML Universal Milling Machine, catalog M-1662.

CINCINNATI 8" x 18" Tool and Die Milling Machine, catalog M-1620.

Training your boys on machines built for industry gives them the confidence they will need when they're "on their own." Several CINCINNATI machines that will be seen by your graduates wherever they go are suitable for vocational schools. Four of them are shown here. 1. CINCINNATI No. 2ML Milling Machine ... for a variety of milling work, from cutting helical gear teeth to boring holes with fly cutters. 2. CINCINNATI No. 2 Cutter and Tool Grinder ... for sharpening most of the cutters used in the average shop; milling cutters, planer tools, reamers, taps, etc. 3. CINCINNATI 8" x 18" Tool and Die Milling Machine ... for making small dies and molds; for a variety of light milling operations. 4. CINCINNATI 12" Hydraulic Universal Grinding Machine ... for all the variations of external grinding (straight cylindrical, taper, bevel, face), and for internal grinding. All these machines are safe and ruggedly built to withstand uncertain handling by students. You may obtain complete information by writing for the literature specified under the illustrations.

CINCINNATI 12" Hydraulic Universal Grinding Machine, catalog G-486-5.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI GRINDERS INCORPORATED

Silver Line

SAWS

SIX SIZES—BLADE CAPACITIES TO 12"

SAFER—EASIER TO HANDLE
FAR MORE POWERFUL!

1. SAFETY-LOCK SWITCH—positive protection against accidental starting.
2. EXTRA WIDE REENFORCED STEEL SAFETY BASE for better balance—easier to handle, safer to use.
3. LONG-SHAFT TRANSVERSE MOTOR MOUNTING transmits as much as 25% extra power, supports blade on oversize ball bearings from one side of the tool clear to the other.
4. UNIQUE SHOCK-ABSORBER GEARING harnesses the added power of these great new saws, gives extra life to motor, gears, spindle and blade.
5. PROTECTED DEPTH AND BEVEL SCALES. In plain sight when you use them—out of the way when you don't. Always accurate.

INDEPENDENT PNEUMATIC TOOL CO.
AURORA, ILLINOIS

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Thor PORTABLE POWER TOOLS

Write Today For Free Electric Tool Catalog E-2

ASK FOR THE Silver Line

Belt Sanders
Bench Grinders
Drills
Drill Stands
Fender Hammers
Grinders
Electric Hammers
Impact Wrenches
Nibbler
Nut Setters
Polishers
Sanders
Saws
Screw Drivers
Tappers
Valve Refacers
Valve Reseaters
Air Tool Kits

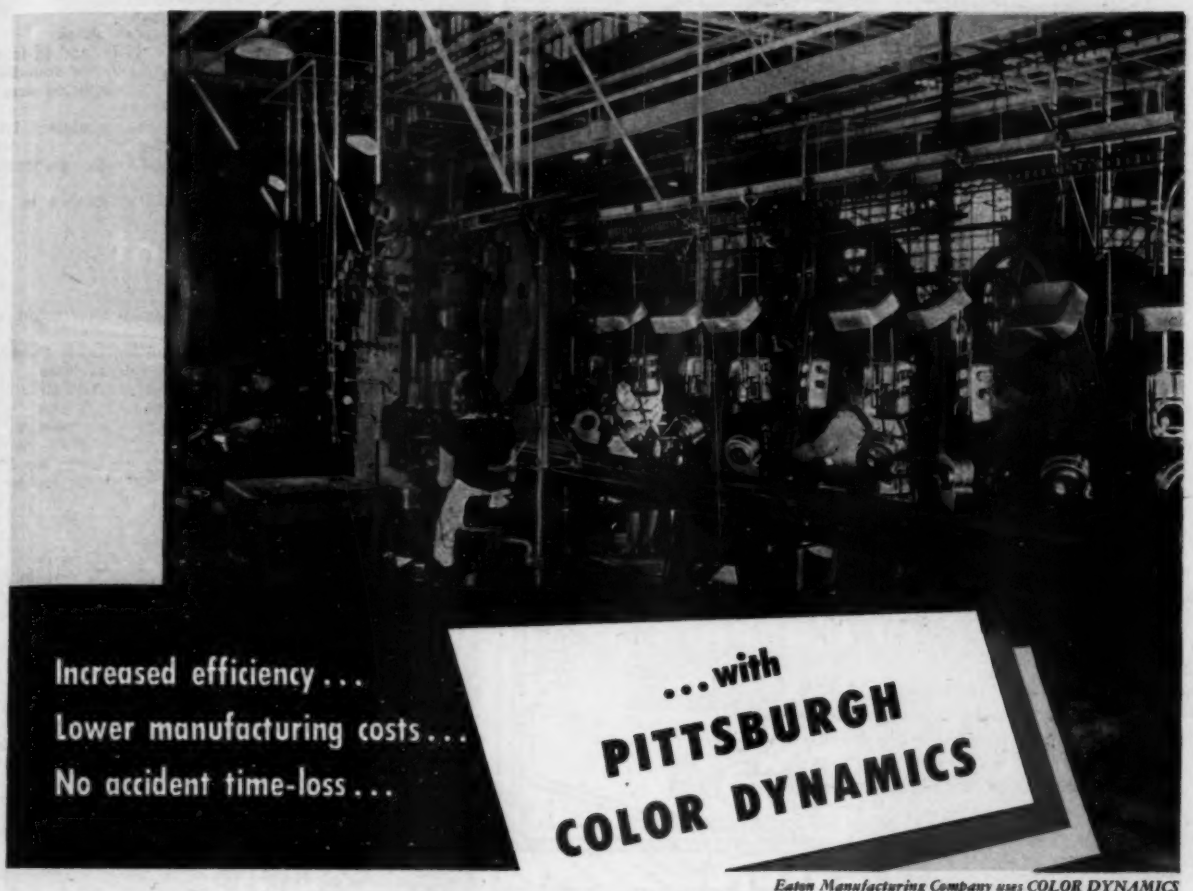
(Continued from page 24A)

b) Blades, power, 14T, 12 in.
c) Frames, adjustable
HAMMERS
a) Babbitt
b) Ball peen, 13 oz., 16 oz., or 20 oz.
c) Blacksmith's, various kinds
d) Riveting, 9 oz., and 12 oz.
e) Setting
INDICATOR
a) Center
b) Universal or universal dial test
c) Speed
KNURLING TOOL — with assorted knurls
LADLES
a) Bull
b) Hand bowls
c) Melting
LATHE DOGS — ½ in., ¾ in., 1 in., 1½ in., 2 in., 2½ in., and 3 in.
LEGGINGS — fireproofed duck, to protect students when pouring in foundry
LEVEL — 6-in. bench
LIFTING SCREWS — for molders
MALLETS — wood or soft
MANDRELS — selected sizes
MICROMETERS — inside, 1½ in. to 8 in.; outside, 0 to 1 in.; outside, 1 in. to 2 in.; outside, 2 in. to 3 in.
MOLDING BOARDS
MOLDING STICKS AND TROWELS — various kinds
NIPPERS — end cutting, 5 in.
OIL STORAGE TANK — with pump
OILSTONES — medium and fine
PAILS — galvanized, 12-qt. capacity for foundry
PARALLELS
a) Adjustable
b) Steel, assorted sizes
PLIERS
a) Combination, 6 in.
b) Side-cutting, 6 in.
PUNCHES
a) Center, ¼ in. and ⅜ in.
b) Hollow, ½ in., ¾ in., and 1 in.
c) Pin, ⅛ in., 5/32 in., 3/16 in., 7/32 in., and ¼ in.
d) Prick, ¼ in.
RAMMERS — for foundry
a) Hand
b) Floor
REAMERS — various sizes
a) Adjustable
b) Hand
c) Taper pin
d) With taper shank
RIDDLES — ¼-in. and ⅜-in. mesh, 18-in. diameter, for foundry
RIVET SETS — assorted sizes
SCALES
a) Steel, 6 in., graduated 1/64 in. to ⅛ in.
b) Steel, 12 in., graduated to 32nds
SCREW DRIVERS — 6 in. and 9 in. blade
SCRIBERS
SHOVELS
a) Coke
b) Sand
SNIPS — tin, 3 in. straight and 3 in. curved
SOCKETS — for taper shanks, drill and tools, selected sizes
SOLDERING COPPERS AND HANDLES — 1-lb. size
SPRAY CAN — for molders
SPRINKLING CANS — galvanized iron, 16-qt. capacity, for foundry
SPRUE PICKS — for molders
SQUARES
a) Machinist's, 6 in.
b) Blacksmith's
STEEL FIGURES, ⅛ in.
STEEL LETTERS — ⅛ in.
SWABS — for molders
TAPELINE — steel, 25 ft.
TAPS AND DIES
a) Machine screws
b) Pipe
c) N.F. ¼ in. to ¾ in.
d) N.C. ¼ in. to ¾ in.
TONGS
a) Blacksmith's, various kinds
b) Pick up, for foundry
c) Shake out, for foundry
TOOL HOLDERS
a) Boring tools
b) Cutting-off tools
c) Planer
d) R.H. and L.H. offset shank
e) Shaper
f) Slotter
g) Straight shank
h) Threading
TOOL-HOLDER BITS — square, ¼ in., 5/16 in., ⅜ in., 7/16 in., ½ in.
TRAMMEL POINTS
V BLOCKS AND CLAMPS
WHEEL DRESSER
WRENCHES
a) Adjustable, 8 in. and 10 in.
b) Pipe, 8 in. and 12 in.
c) Tap, adjustable, various sizes

Metalworking—
Materials and Supplies

ABRASIVE CLOTH — aluminum oxide. Grits 320 to 24, obtainable in sheets or rolls from 1 to 28 in. wide
ABRASIVE WHEELS
ACETYLENE GAS — in drums for welding
ALUMINUM
a) Pigs for foundry
b) Sheets, tubing, rounds, shapes, wire, etc.
BABBITT METAL
BEARING BLUE
BELT DRESSING
BELT LACING MATERIAL
BELT LEATHER
BOLTS
a) Carriage, selected sizes
b) Lag, selected sizes
c) Machine, selected sizes
d) N.F., selected sizes
e) Stove, flat or roundheads, selected sizes
BRASS
a) Bars, 3/32 in., ⅛ in., 3/16 in., and ¼ in. thick; ⅜ in. to 1 in. wide, 8 ft. to 10 ft. long selected sizes
b) Round rods, 3/16 in. to ½ in. by 16ths, selected sizes
c) Sheets, 28 to 32 American gauge, 12 in. wide by 72 in. to 84 in. long, selected sizes

(Continued on page 29A)



Eaton Manufacturing Company uses COLOR DYNAMICS to improve production in automotive heater division.

Modern vocational schools teach future shopmen how this new painting system benefits management and workers alike

TRAINING of skilled shopmen is no longer confined merely to courses in metal, machinery and methods. It includes study of the influence of physical and psychological factors upon workmen and their output.

That's why vocational and manual science teachers now include Pittsburgh COLOR DYNAMICS in their curricula. They recognize that greater knowledge and more widespread use of this system of painting are making great contributions to the improvement of production and the welfare of workers.

● **COLOR DYNAMICS** is based upon human reactions to the *energy in color.* Science has established the fact that color has a marked influence upon physical, mental and nervous systems.

Shopmen in many plants are finding that color properly "engineered" on machines, walls, floors and ceilings of their plants actually produces *more work per man-hour and more man-hours per man.* Wherever Pittsburgh COLOR DYNAMICS has been applied in industry both management and employees are unanimous in praise of the results.

● **COLOR DYNAMICS** requires that every color used on walls, floors, ceilings, machines and mobile equipment perform definite duties. By the use of *focal* and *eye-rest* colors, operating parts of machinery are separated from stationary parts and the materials being fabricated. The worker is able to see his job better. Eye-fatigue, so often the cause of lowered efficiency, is lessened. *Morale-building* colors improve the worker's mental attitude toward his job. *Safety* colors warn him of danger areas and reduce accident hazards.

● **If you want** your students to be equipped thoroughly for their future tasks, begin now to teach Pittsburgh COLOR DYNAMICS in your classes. Better still—demonstrate its principles in a practical manner. Apply them in the decoration of your classrooms and equipment—and see the difference it makes.

● **Send Today** for a free copy of our booklet on COLOR DYNAMICS which contains a full explanation of this painting system and how to use it.

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MAKE THIS TEST YOURSELF: Reproduce a Turquoise pencil tracing by any method you choose. Note that every detail comes out sharp. *Electronic graphite (used exclusively in Turquoise) is reduced in Eagle's patented attrition mill to particle sizes of 1/25,000" to deposit knife-edge lines of maximum opacity.

STRONGER POINTS, SMOOTHER LEAD: You'll find "Chemi-Sealed" Turquoise points stronger because of Eagle's patented super-bonding process . . . the lead smoother because impregnation with rare waxes gives every particle of the lead a film of lubricant to glide on.

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*TURQUOISE

DRAWING PENCILS AND LEADS

EAGLE PENCIL COMPANY • NEW YORK • LONDON • TORONTO

*Reg. U. S. Pat. Off.

(Continued from page 26A)

d) Strips, 1/32 in. and 1/16 in. thick, ½ in. to 1½ in. wide, 50 ft. to a coil, selected sizes
e) Threaded rods, Nos. 6 to 10, in 24 in. lengths. Nos. 12, 14, ¼ in., and 5/16 in., in 24 in. lengths, selected sizes
f) Wire, soft, 8, 11, and 14 American gauge, selected sizes
g) Wire, spring, 8 to 22 American gauge, selected sizes

CASEHARDENING COMPOUNDS
CHAPLETS — single and double head
COAL
a) Charcoal for foundry or forge
b) Coke for foundry
c) Forge
COPPER
a) Pigs, for casting alloys
b) Sheets, 8 to 25 American gauge, 30 in. by 60 in., selected sizes
c) Tubing, outside diameters, 3/16 in., ¼ in., 5/16 in., ⅜ in., ½ in.; thickness of wall, 1/32 in.; lengths, 8 ft. to 12 ft., selected sizes
d) Wire, soft, 2 to 20 American gauge, in coils. Also in ¼, ½, and 1 lb. spools, sizes 16 to 36, English gauge, selected sizes
CORE
a) Compounds
b) Flour
c) Paste
d) Oil
e) Wax-vent wire
CUTTING COMPOUNDS
FIREBRICKS AND CLAY — for foundry
FIRE HANDLES — assorted sizes
GRAPHITE — for foundry
IRON — Pig, for foundry
LACQUER — transparent and colored, for finishing
NUTS — S.A.A., acorn cap, castellated, square, hexagon, joint, and wing, selected sizes and kinds
OIL
a) Boiled linseed
b) Lubricating
c) Quenching and hardening
PACKING
Round, sheet, square, or tubular
PAINT — back asphaltum
PINS
a) Cotter, 3/32-in. to ¼-in. diam. from ½ in. to 2 in. long
b) Flask, for flask repairs
c) Taper, Nos. 0 to 6, ¾ in. to 2 in. long
PUMICE POWDER
RIVETS
a) Copper, with burrs, Nos. 7 to 14, lengths, ⅜ in. to ¾ in., selected sizes
b) Iron, No. 14 gauge to 3/16 in., flathead or button head, ¼ in. to 1 in. long, selected sizes
c) Tinners', flathead, 8 oz. to 16 lb., either tinned or black, selected sizes
SAND
a) Molding, in 350-lb. barrels or 800-lb. casks
b) Parting, in 350-lb. barrels or 800-lb. casks
SCREWS
a) Flathead or roundhead iron or brass, selected sizes and kinds
b) Cap and machine, iron or brass, selected sizes and kinds
c) Set, head and headless
SOLDER — acid or rosin core; bar, or solid wire
SOLDERING PASTE OR SALTS
STEEL
a) Bessemer, rod, 1/64 in. to ⅜ in. by 64ths, in 4-ft. lengths, selected sizes
b) Bars, cold rolled, ⅛ in. to ⅜ in. thick, ½ in. to 2 in. wide, 12-ft. lengths, selected sizes
c) Drill rod, letter sizes, A to Z, number sizes, 1 to 80, in 3-ft. lengths, selected sizes
d) Rods, hexagon and square, cold rolled, ¼ in. to ¾ in., in 12-ft. lengths, selected sizes
e) Round, cold rolled, diameters ⅛ in. to 1 in., lengths 12 ft., selected sizes
f) Sheet, black, Nos. 18, 20, 22, 24, 26, 28, U. S. gauge; size of sheets, 24 in., 28 in., and 30 by 96 in.
g) Sheet, galvanized, Nos. 18, 20, 22, 24, 26, 27, and 28 U. S. gauge; size of sheets, 24 in., 28 in., and 30 by 96 in., selected sizes
h) Threaded rods, Nos. 6 to 10, in 12-in. lengths. Nos. 12, 14, ¼ in., and 5/16 in., in 24-in. lengths, selected sizes
TIN
a) Pigs, for casting alloys
b) 1C, 1X, 20 by 48 in.
c) 1XX, 20 by 48 in.
WASHERS AND BURRS
a) Copper, burrs, Nos. 3 to 14, in 1-lb. boxes
b) Iron burrs, Nos. 3 to 14, in 1-lb. boxes
c) Brass washers, 3/16 in. to ½ in. by 16ths
d) Iron washers, 3/16 in. to ½ in. by 16ths
WELDING FLUXES
WELDING RODS (all rods come in 24-in. lengths)
a) Brazing, 1/16-in., ⅛-in., and 3/16-in. diameter
b) Cast aluminum, 3/16-in., ¼-in., and ⅜-in. diameter
c) Cast brass, 3/16-in., and ⅛-in. diameter
d) Cast bronze, ¼-in. diameter
e) Cast copper, 3/16-in. and ¼-in. diameter
f) Cast iron, 3/16-in., ¼-in., 5/16-in., and ⅜-in. diameter
g) Low carbon steel, ⅛-in., ¼-in., and ¼-in. diameter
WHITE LEAD — for machine shop
WIRE
a) Annealed, 16 to 34 W and M gauge, selected sizes
b) Coppered market, 5 to 18 W and M gauge, selected sizes
c) Coppered spring, 2 to 18 W and M gauge, selected sizes
d) Galvanized, 5 to 18 W and M gauge, selected sizes
e) Piano, Nos. 2/0 to 36, selected sizes
f) Tinned, 16 to 24 W and M gauge, selected sizes
g) Wool, Nos. 0 to 3 in 1-lb packages, selected sizes
ZINC
a) Pigs, for casting alloys
b) Sheet, Nos. 4 to 14, sheets 36 in. by 84 in.

Students learn welding safely, quickly, easily

...with the TR-180

P&H Dial-lectric Welder

Welds anything from thin sheet metal to ¾" steel plate — over full range of 20 to 180 amps.

Here's a welder without troublesome mechanical devices for controlling amperage. It has the simple and exclusive Dial-lectric control.

The student just plugs in welding cable to desired range. He can't go wrong: Each range is clearly indicated by its own color on both plug socket and control dial. Then he regulates heat by turning the single radio-type knob.

Students trained on the TR-180 quickly find their places in industry; P&H Welders are used on jobs everywhere.

The P&H Dial-lectric Welder meets school specifications in other ways, also:

100% Safe! Approved by REA, NEMA, and UL.

Withstands student abuse! Nothing to get out of order. No moving parts to wear out.

Easy to operate! Student strikes arc quickly — no snuff-outs.

Convenient! Ground connection is permanent. Student doesn't have to plug in ground every time he welds.

There are other reasons why it pays you to specify *P&H Dial-lectric* on your requisition for welders. Get all the facts. Send coupon below for bulletin.

There's a **P&H Electrode** for every job

For clean, strong welds on mild steel, spring steel, stainless, malleable, and cast iron, or for hard surfacing. In small, convenient packages—with simple, complete instructions any student can understand.

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SHELDON

You really need a precision milling machine for a complete course in shop practice

For floorspace occupied, this milling machine will add more teaching capacity to a school shop than any other piece of equipment. Occupying a floorspace of only 18" x 24", requiring only 29" x 39" including operating space, and moderate in price, a SHELDON No. 3000, Size "0", Milling Machine will hold its extreme accuracy even under "student abuse." It can be bought as a basic machine to come within a budget, and, power feeds, universal heads, etc., added at any time. It is a safe tool, is completely enclosed. All speed changes and feed changes are made by external hand wheels and levers from the normal operating position.

AVAILABLE ACCESSORIES AND ATTACHMENTS

- POWER HEAD
- UNIVERSAL HEAD
- DIVIDING HEAD
- COOLANT SYSTEM
- ROTARY TABLE
- SWIVEL VISE
- DRIP POT OILER

Write for Specification Sheet and Catalog

SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers

4244 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.

WOODSHOP MACHINERY AND SAFETY

(Continued from page 22A)

5. Whenever possible, use working forms, patterns, or holders; fasten the work in them securely; if a table guide is used, make sure that it cannot slip.

6. Always use a brush to remove loose material from around the knives. Never rest the hands near the edge of the material being cut.

7. Do not "back up" on a cut; avoid taking deep cuts and feeding the stock too rapidly.

8. Do not permit stock, finished work, or chips to accumulate on the table; clear away rubbish and all other objects from the floor where they may be a tripping hazard.

9. Before leaving the machine for any purpose, shut off the power and wait until the knives stop.[8]

The Belt Sander

1. Always use the proper "sanding block" to hold the moving belt against the work.

2. Hold the stock firmly against the stop on the table.

3. Exercise special care when sanding small and irregular pieces.

[8]Safety Instruction Card No. 403, National Safety Council, Chicago, Ill.

The Electric Hand Shaper and Router

1. When changing cutters, make sure that the drop cord has been disconnected.

2. Hold the machine firmly.

3. Do not feed faster than the machine will cut.

4. When cutters have been changed, get the approval of the instructor before you begin to cut.

5. Always clamp stock to be cut firmly in the vise. When cutting an assembled project, see that the student holds it securely and safely.

6. When operating the hand shaper, beware of dangling ties.

The Tool Grinder in the Woodshop

1. Emery wheel operators must wear goggles.

2. When grinding, hold tools securely.

3. Forbid the grinding of fiber, brass, wood, etc. Such grinding damages the cutting properties of the wheel.

4. Remove steel slivers immediately and give first aid.

5. Never force so hard so as to burn the edge of the tool.

6. Do not tamper with the tool rest or the wheel guard.

7. Do not hold material to be ground with pliers. Use a safety holding clamp.

8. Do not permit tools or articles being ground to slip down between the wheel face and the tool rest. Such slipping can cause injury or break the stone.

9. Keep grinder wheels clean and sharp by frequent cleaning.

10. Do not remove guards unless special grinding demands this removal. Remove them then only upon the approval of the instructor.

Complete obedience to all the safety rules which govern the operations of the various woodshop machines is necessary, if machine accidents in the woodshops are to be reduced to a minimum. The rapidly moving parts of a machine are a potential accident hazard; both the teacher and the student must be constantly aware of the impending dangers. If these machines are operated with due respect for the safety rules just cited, accidents on these machines might occur, but they will not be caused by lack of information.

WHY NOT TEACH SILK SCREEN PRINTING?

THOMAS A. HARRIS
College Park, Md.

Industrial-arts teachers and supervisors who are in search of an additional area for the general shop which will offer the pupils a new field for exploration and experimentation might do well to investigate the possibilities of the silk screen process of reproduction.

Basically an adaptation of the ancient art of stencil printing, the silk screen process lends itself well to use in the school

(Continued on page 32A)

SPECIFY Hotpack EQUIPMENT

For Long Satisfactory Service

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Look at These Features and Compare

Hotpack ELECTRIC CERAMIC KILNS

Designed for Use in Art Courses in the School —TWO LINES — Regular & Automatically Controlled

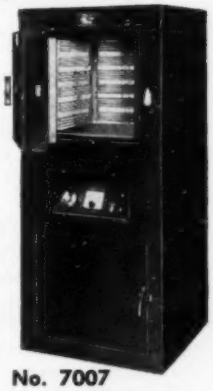
No. 7004

1. Eye level controls — pilot light.
2. Built-in pyrometer for visible accurate temperature indication.
3. Handles are cool to touch.
4. Control switch — low, medium and high heat for even distribution.
5. Special insulation holds heat and prevents scorching of table top.

NEW Hotpack AUTOMATICALLY CONTROLLED KILNS WITH BUILT-IN CONTROLLER — LIMITSTAT ACCURATE — SAFE — DEPENDABLE

These kilns are furnished with an AUTOMATIC SHUT-OFF, and INDICATING CONTROLLING PYROMETER. They have all the features of our regular line plus —

- **Prevent overfiring, thus protecting your ware and kiln from damage.**
- **Permits accurate enamelling on glass, or metal and gives much wider range within close temperature limits.**
- **Same specifications as the regular line except price.**



No. 7007

SPECIFICATIONS

Model No.	Interior Size	Cubic Inches	Shelves Furnished	Max. Temp.	Approx. Time	Electrical Characteristics	Ship. Wgt.	Price F.O.B. Phila.
7006	8"x 8"x 5½"	352	1	2050° F.	3 hrs.	115 V-15 Amp.-1700W	180 lb.	$ 60.00
7004	8"x 8"x11"	704	2	2050° F.	4 hrs.	115 V-15 Amp.-1700W	200 lb.	87.50
7005	12"x12"x11"	1584	2	2050° F.	3 hrs.	220 V-23 Amp.-5000W	350 lb.	187.00
7007	15"x15"x16½"	3613	3	2050° F.	4 hrs.	220 V-30 Amp.-6600W	550 lb.	375.00

AUTOMATICALLY CONTROLLED

Model No.	Prices F.O.B. Phila.
7006 A	$130.00
7004 A	175.00
7005 A	275.00
7007 A	450.00

No. 600

Hotpack PLASTIC PRE-HEATING EQUIPMENT ELECTRIC PORTABLE OVEN

For preheating Methyl Methacrylate in sheet or rod form where it is necessary to maintain even temperature throughout the sheet, especially desirable in compressed air, vacuum or pressure forming techniques.

The Oven is controlled by a newly developed thermostatic control, sealed in and conveniently placed on the front panel of the Oven. It can accurately be set at any desired temperature where a quick rate of heat up to 360° F. is desired.

Due to the Aluminum Construction, the Oven is very light in weight and can be carried from room or project to project. As it operates on 110 volt AC or DC, it can be plugged into any 110 volt receptacle.

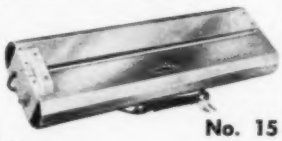
SPECIFICATIONS

Model	Interior Size	Exterior Size	Wattage 110V AC-DC	Shipping Weight	F.O.B. Phila. Price
600	12"Wx12"Dx12"H	16"Wx19"Dx24"H	700	60 lbs.	$ 75.00
602	24"Wx12"Dx12"H	28"Wx19"Dx24"H	1400	110 lbs.	125.00

THE NEW Hotpack ELECTRIC PLASTIHEETER

Designed for Use in Plastic Courses in the School

The HOTPACK PLASTIHEETER is a commercial type strip heater designed to heat sheets of Plexiglass or Lucite until they become soft and pliable for shaping to the form desired. It is essentially used for straight line bends or folds and is capable of heating sheet material up to ⅛" thickness in from 30 seconds to 4 minutes depending on the thickness of the material. As the material does not come into contact with the heating element and the platen remains cool, there is no possibility of creating mark-off on the sheet.



No. 15

SPECIFICATIONS

Model No.	Working Space	Overall Size	Wattage 115 Volt	Shipping Weight	F.O.B. Phila. Price
15	18"Lx5"Wx2½"H	21"Lx7"Wx3½"H	200 W	4 lbs.	$15.00
16	30"Lx5"Wx2½"H	32"Lx7"Wx3½"H	350 W	6 lbs.	25.00

Hotpack ELECTRIC HEAT TREATING FURNACE

No. 7054

For Hardening, drawing, tempering and annealing or normalizing of dies, punches, gages, fixtures or other parts are performed readily with these redesigned Hotpack Electric Box Furnaces.

Pilot Lights indicate operation of electric heating elements which are encased in ceramic. Elements can be serviced conveniently. Heat loss is prevented by ample insulation. Welded steel cabinet is finished in black wrinkle enamel.

This new Hotpack Electric Furnace is fast heating, built for continuous use from 300° F. to 2000° F. It is the only Furnace equipped with Automatic Controlling-Indicating Pyrometer and also with Limitstat control in this price field.

SPECIFICATIONS

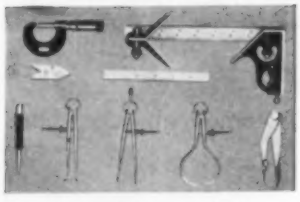
Model	Interior Size W. D. H.	Current Characteristics	Shipping Weight	Price F.O.B. Phila.
7056	8"x 8"x 5½"	110 V-AC-15 Amp.	180 lbs.	$130.00
7054	8"x 8"x11"	115 V-AC-15 Amp.	200 lbs.	175.00
7055	12"x12"x11"	220 V-AC-23 Amp.	350 lbs.	275.00
7057	15"x15"x16½"	200 V-AC-30 Amp.	550 lbs.	450.00

THE ELECTRIC Hotpack COMPANY, INC.

5067 COTTMAN AVENUE • PHILADELPHIA 35, PA.

Starrett

YOUR PARTNER IN PRECISION



PRECISION TOOLS

Starrett Catalog No. 26 "CE" shows many tools and kits of tools especially suited for school shop use . . . the same fine tools used by skilled mechanics. Write for your copy.

HACKSAWS

Precision made in a new, modern plant by the World's Greatest Toolmakers in all standard sizes for cutting metal by hand or machine. Write for Starrett Hacksaw and Band Saw Book.

BAND SAWS

For cutting metal, wood, plastics, etc. Available in coils of any length or cut to length and welded. Also Band Knives for cutting soft or fibrous materials.

STARRETT SET OF TOOLS No. 902

The essential measuring tools for modern class projects. Includes 1" micrometer, combination square with center head and 12" blade, center gage, center punch, 6" flexible steel rule in pocket case, 4" divider, 4" inside caliper, 4" outside caliper and 4" hermaphrodite caliper — in a compact folding case.

BLUE PRINT SETS

Fourteen blue-printed 8"x 10½" punched notebook sheets, each illustrating an important tool and its uses. Furnished to instructors at cost — 10 cents per set.

THE STARRETT BOOK FOR STUDENT MACHINISTS

Widely used as a shop class text book. Provides essential information about tools, machines and modern methods in simple shop language. 200 illustrations, 30 reference tables. Only one dollar per copy.

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Standard of Precision

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS • DIAL INDICATORS • STEEL TAPES • HACKSAWS BAND SAWS AND BAND KNIVES • PRECISION GROUND FLAT STOCK

Buy Through Your Distributor

THE L. S. STARRETT CO. • *World's Greatest Toolmakers* • **ATHOL, MASSACHUSETTS, U.S.A.**

SILK SCREEN PRINTING

(Continued from page 30A)

shop. It offers a distinct change from the all too familiar areas of woods, metals, and electricity.

The process is quite simple and can be learned in a very short time. Seventh-grade pupils have done a creditable job using the process after approximately one half hour's instruction and observation of the printing process.

Economy, always an important factor to be considered when deciding upon a new area, is a point in the favor of the silk screen process. A beginning outfit may be purchased complete for approximately sixty dollars. A small saving may be realized if certain parts are made in the shop; the printing frame and baseboard can easily be constructed by the pupils or by the teacher. Naturally the amount of materials and the size of the printing frame will depend upon the type and size of the contemplated projects.

In considering safety, this method of printing has much in its favor. The absence of sharp edges, high speed cutters and other uncontrollable factors makes the use of the silk screen area in a junior high school shop quite safe. The entire printing is done by hand and the greatest hazard is damage to clothing caused by the spilling or splashing of paint. Such hazards may be eliminated by using a little care and wearing proper protective clothing.

The range of effects and the fact that printing may be done on a variety of surfaces, in addition to the economy, have increased the use of this process for industrial purposes. Its versatility has been demonstrated by its use in printing such varied articles as: posters, greeting cards, designs on drinking glasses and milk bottles, outdoor signs, toy decorations, textile patterns, and designs on T shirts.

Use of the process in the school shop will produce results which are both pleasing and professional. To mention a few of the possibilities: decorated wood and metal trays, etched glassware, decorated textiles, posters and greeting cards may be made by pupils in the shop.

The avocational and vocational possibilities of the silk screen printing process, although somewhat limited by individual abilities, are indeed many. For the student who cannot afford, or does not have the space for the more common home workshop tools, it offers a medium which is adaptable to almost any working area. It is comparatively noiseless and if sufficient care is taken, not too messy. Many persons who carry on this type of work do the actual printing on a common card table. Of course, more space is needed for drying the printed matter. In addition, even as a hobby it can yield financial returns if the individual has the necessary acumen to find jobs. As has been previously mentioned it may be used for printing posters, greeting cards, outdoor signs, and textile patterns any of which may be as easily done in the home workshop as in a larger commercial establishment.

As a vocation, it is usually done in conjunction with a sign painting shop and almost every town boasts of at least one of these. In the larger establishments the printing is done more or less mechanically and the operator is responsible for one or more machines.

If the industrial-arts general shop is, in so far as is possible, an introduction to a vocation, an attempt to develop the avocational possibilities of the pupils and a study of industries and industrial processes and materials — why not teach silk screen printing?

SELECTED REFERENCES

Biegeleisen, J. I., "Silk Screen Stencil Printing," *Industrial Arts and Vocational Education*, 34: 305–6, Sept., 1945; "Block-out Stencil Method," *Industrial Arts and Vocational Education*, 34:358,

(Continued on page 36A)

Sebastian 16" x 6' LATHE

8-SPEED GEARED HEAD

$1995 PLUS FREIGHT

"Best Buy" in the Medium-Price Field!

A *Complete* Lathe, including the Following STANDARD EQUIPMENT:

DRIP PANS • THREADING DEPTH STOP • TOOL POST
CENTERS • LEVELING SCREWS & PLATES • FACE PLATE
MOTOR & WIRING • REVERSING SWITCH • SPINDLE SLEEVE
DOG PLATE • WRENCHES • CABINET LEG

PRINCIPAL SPECIFICATIONS

Swing over bed	16¼"
Width of bed	11¼"
Length of carriage	22¼"
Speed range, std. r.p.m.	20 to 487
Speed range, high r.p.m.	30 to 741
Number of thread and feed changes	57
Feed range	.002" — .259"
Thread range per inch	3 to 384
Horsepower of motor	2
Weight, crated	2525 lbs.

At the price featured above, this sturdy "King-made" 16" x 6' Sebastian Lathe is by all odds the best investment in the medium-price lathe field today.

Here's simple design, husky construction, sound engineering, a host of special features, in a general purpose Lathe with unusual ease of operation and low, LOW maintenance cost!

The Sebastian's many outstanding features include a powerful 8-speed geared head—Timken Bearings on all headstock shafts—reverse in apron for feeds—control handle on apron for longitudinal friction feed—accuracy .0005" at every point of alignment.

Sebastian general purpose Lathes are available in 12" and 20" swing, as well as the 16" shown here—also Gap, Clutch and Brake, and other special types.

Before deciding on any lathe, it will pay you to make a point-by-point and dollar-for-dollar comparison of the Sebastian Lathe with others in the medium-price field. A thorough investigation will convince you that the modern Sebastian is *your* "best buy"!

Send For These FREE CATALOGS!

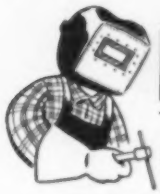
Illustrated Sebastian Catalogs S-1 (Standard Lathes) and S-101 (Special Lathes—Gap, Clutch & Brake, etc.), give complete description and detailed specifications. See for yourself why the modern Sebastian is today's outstanding value!

American Steel Foundries

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

Builders of King Vertical Boring & Turning Machines and Sebastian Lathes



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Instant arc A.C. WELDERS

Marquette 262 C Welders are built for heavy-duty-production welding and are well adapted for 'round the clock instruction. Special transformer design gives "Instant Arc Striking" **without** high frequency or booster gadgets. Clearly marked heat stages simplify worksheet instruction . . . no confusing dials or controls to adjust.

Built-in Capacitor for High Power Factor. Telnic Bronze plugs and sockets double current carrying capacity in high heats. Generous use of aluminum increases transformer efficiency. Quiet in operation. No "Magnetic Blow." Low operating cost, Low maintenance cost. No moving parts to wear out or get out of order. Fully Equipped. 12 models 125 to 275 amps.

Use famous Marquette Electrodes in your classes. Buy the handy 5-1016 ROD-PAK or Standard 50 lb.

Teach with Dependable MARQUETTE *Welding Equipment*

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...the Standard of American Industry

MARQUETTE

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WELDING and CUTTING EQUIPMENT

A Complete line of high quality Oxy-Acetylene Welding and Cutting Equipment, Acetylene Generators, Gas Rods, Fluxes and all Welding Accessories. There are 10 Outfits or Combinations to meet every need No. 1 Outfit is designed to take all welding, brazing and cutting jobs in stride speedily and efficiently. Highest quality Oxygen and Acteylene Regulators. Self-aligning tips and needle valves. All vital threads and seats are fully protected by mixing section. construction.

Sold Exclusively Through the Nation's Leading Distributors

MARQUETTE *Welding* EQUIPMENT

A.C. ARC WELDERS · ELECTRODES
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BIG NEWS

A different name for your old friends...
PROTO TOOLS
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PLOMB TOOLS

In your work, you deserve the best. And that means you deserve PROTO tools—formerly Plomb tools—the favorites of professionals for 42 years. User-tested designs make them easy, fast and safe to use. Special steels and scientific heat treating give them long life. Remember the new name—PROTO tools—formerly Plomb tools. Buy them today from your dealer.

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PROTO TOOLS
Professional Quality
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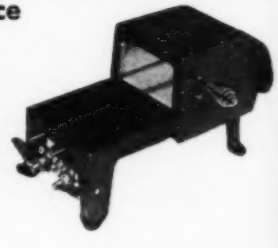
LOS ANGELES
MADE IN U.S.A.

TEACH HEAT TREATING WITH JOHNSON FURNACES

No. 101 Bench Furnace

Delivers up to 1800° F. without a blower. The most efficient, powerful and economical bench furnace made for heating soldering coppers up to 12 lbs. per pair. Also used for heat treating, case hardening, and annealing carbon steels. Two burners. Firebox 3¾ x 4½ x 5½. Complete with work rest block and baffle plate.



$17.50 F.O.B. Factory

No. 118 Combination Bench Furnace

Use this furnace for heating largest soldering coppers, stenciling irons, branding irons, etc. Also for heat treating carbon steels. Lid on hood may be removed and 22 lb. melting pot inserted for melting soft metals such as lead, tin, zinc, babbitt, etc. Two burners. Firebox 6¼ x 5 x 6½. Complete with pot as illustrated.

$33.00 F.O.B. Factory

FREE CATALOG

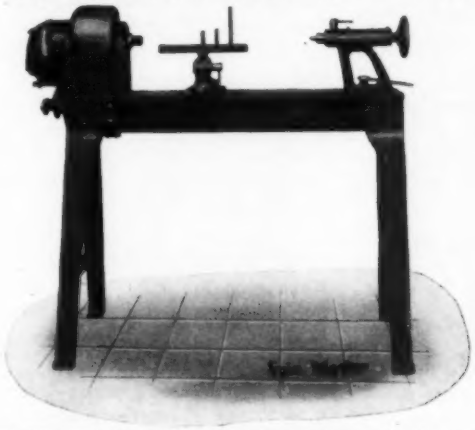
Renew the efficiency of your present Johnson Furnaces. Write for complete details on Factory Reconditioning.

JOHNSON GAS APPLIANCE CO.
585 E AVENUE N.W. CEDAR RAPIDS, IOWA

Spin Master

REG. U.S. PAT. OFF.

15 "METAL SPINNING LATHE"



- Spin Master Metal Spining Lathes are known in the trade to be the most substantial and the most productive causing least operator fatigue.
- They are also best for training purposes.
- The Model MS 15 shown above is not a converted wood turning lathe. It is engineered for fast production spinning. Available with floor or bench legs.

Write for particulars.

HAAG MACHINE CO.

221 WARBURTON AVE. HAWTHORNE, N. J.

NO MORE hacksawing drudgery that everybody hates.

NOW!

HAND-I-HACK*

*Trade Mark Reg. U. S. Pat. Off.

PORTABLE POWER HACK SAW

Hand-I-Hack is the ideal hack saw for school shops. Requires little space. Can be used on and readily stored beneath any bench. It will work in any position. Extremely accurate and will cut any material up to 3" x 3". Simple, rugged, easy to understand and use. Low in first cost; cheap to operate. Uses standard hand blades. Can be afforded by any school shop. Write for literature.

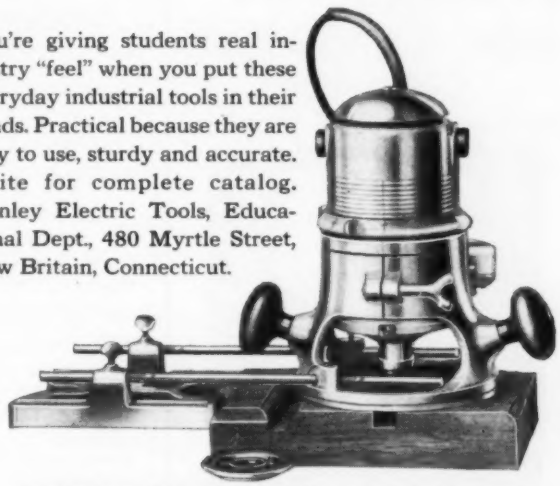
*Trade Mark Reg. U. S. Pat. Off.

Lipe-ROLLWAY CORPORATION

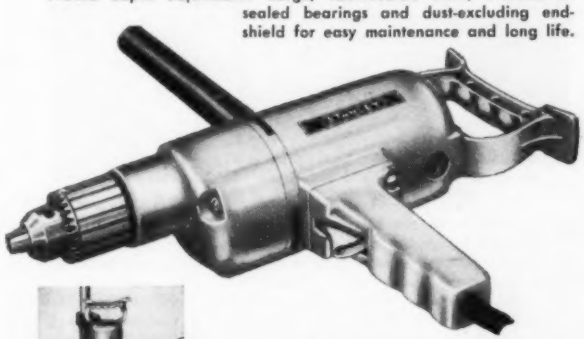
830 Emerson Ave. Syracuse, N. Y.

STUDENTS RESPECT THESE INDUSTRY TOOLS

You're giving students real industry "feel" when you put these everyday industrial tools in their hands. Practical because they are easy to use, sturdy and accurate. Write for complete catalog. Stanley Electric Tools, Educational Dept., 480 Myrtle Street, New Britain, Connecticut.



Stanley-Carter RSA 1 h.p. Portable Router Performs a range of work in wood, plastics, soft metals often delegated to costly, stationary machines. Extra margin of power, 18,000 r.p.m., for smooth operation and clean cutting. Low center of gravity for easy handling. Precise depth adjustment. Large, heat-treated shaft, oversize oil sealed bearings and dust-excluding end-shield for easy maintenance and long life.



Stanley No. 112½" Electric Drill Lots of power in a compact, lightweight drill. Chuck spindle offset to permit close-quarter drilling without removing pipe or spade handles. Aluminum alloy housing, automatic release safety switch with locking device, thrust ball bearing on spindle, Jacobs 3-jaw Chuck and key.

Stanley No. 524 Drill Stand Simple, fast operating clamp holds No. 112 Drill, converts this tool into sturdy, easy to use drill press.

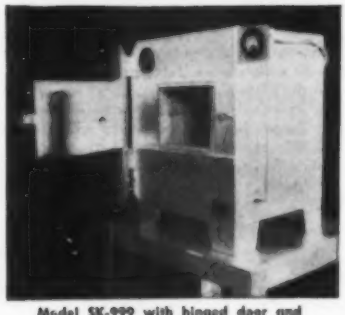
STANLEY

Reg. U.S. Pat. Off.

HARDWARE • TOOLS • ELECTRIC TOOLS • STEEL STRAPPING • STEEL

Harper

STUDIO-SIZE
Electric Kilns
for
HIGH TEMPERATURE CERAMICS
Temperatures up to 2500° F.



Model SK-999 with hinged door and indicating pyrometer.

● Studio Ceramists who desire to explore the high temperature field of Ceramics will want a Harper Electric Kiln, such as the small model pictured above. Stoneware, china and porcelain which have greater strength and vitrification, and crazefree glazes of subtle colors and true brilliance can be fired to perfection in these kilns.

Harper Studio Kilns are especially ideal for the studio potter because they perform dependably and are built to give long service with a minimum of maintenance. Clean uniform electric heat and fine temperature control insure evenly fired ware with few rejects due to firing.

Write to our Kiln Department for recommendations and literature on a Harper Studio Kiln to meet your exact requirements.

HARPER ELECTRIC FURNACE CORPORATION
1445 Buffalo Avenue
NIAGARA FALLS, NEW YORK

SILK SCREEN PRINTING

(Continued from page 32A)

Oct., 1945; "Film Stencil Method," *Industrial Arts and Vocational Education*, 34:418–19, Nov., 1945; "Tusche Stencil Method," *Industrial Arts and Vocational Education*, 34:457–58, Dec., 1945.

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Kosloff, A., "Silk Screen Stencil Printing with Typewriter Stencils," *Industrial Arts and Vocational Education*, 36:261–63, June, 1947.

Orth, M. K., "Intramural Advertising and the Printing Instructor," *Industrial Arts and Vocational Education*, 35:265–66, June, 1946.

Shokler, Harry, *Artists Manual for Silk Screen Print Making* (New York: American Artists Group, 1946).

ORDERING LUMBER FOR THE SCHOOL SHOP

J. ALFRED SEITZ
Industrial Arts Department
High School
Princeton, N. J.

The selection of lumber for a particular purpose is of first importance to the shop teacher. When ordering lumber for the school shop, it should be remembered that your lumber dealer can furnish you with various grades and qualities of soft and hard woods. His ability to supply the lumber you desire can only be the result of careful and exact ordering, following the standardized terminology or specifications which he uses to identify the various grades of lumber.

The lumber industries, in an attempt toward standardization, have adopted *American Lumber Standards* in preparing their association grading rules. American lumber standards have been adopted in principle by Western Pine Association and Southern Pine Association. A full explanation of their rules can be obtained from the following: "Standard Specifications for Southern Pine Lumber," published by Southern Pine Association, New Orleans, La., "Standard Grading Rules," published by Western Pine Association, Portland 4, Ore.

The shop instructor's position, therefore, is to familiarize himself with the standard grading rules and to know the properties and qualities of the lumber best suited for his needs.

A common error in ordering lumber is exemplified in the following: 200 bd. ft. white pine, kiln dried, 1 in. thick. A number of important facts have been omitted, and the possibility of obtaining the lumber desired is very slight.

There are three genuine American white pines: namely, Northern white pine (Pinus strobus), sugar pine (Pinus lambertiana), and Idaho white pine (Pinus monticola). Ponberosa pine (Pinus ponderosa) is not botanically classified as a white pine; however, it is similar to other soft texture pines. The species of wood, therefore, must be the first step included in a typical order.

Then, consideration must be given to the grade of lumber desired. Soft woods, such as fir, pine, spruce, and hemlock, are generally graded as follows:

Finish Lumber	*Common Lumber*
A Select	No. 1 Common
B Select	No. 2 Common
C Select	No. 3 Common
D Select	No. 4 Common
	No. 5 Common

(Continued on page 38A)

Table of Standard Gradings

GRADES OF LUMBER:

Sugar Pine (Pinus lambertiana)	*Ponderosa Pine* (Pinus ponderosa)	*Idaho White Pine* (Pinus monticola)	*Hardwoods* (all species)
1 and 2 Clear	1 and 2 Clear (B & Btr.)	Supreme (B & Btr.)	Firsts
C Select	C Select	Choice (C Select)	Seconds
D Select	D Select	Quality (D Select)	Selects
No. 1 Common	No. 1 Common	Colonial (No. 1 Common)	No. 1 Common
No. 2 Common	No. 2 Common	Sterling (No. 2 Common)	No. 2 Common
No. 3 Common	No. 3 Common	Standard (No. 3 Common)	Sound Wormy
No. 4 Common	No. 4 Common	Utility (No. 4 Common)	No. 3A Common
No. 5 Common	No. 5 Common	Industrial (No. 5 Common)	No. 3B Common

STANDARD THICKNESSES:

Softwoods (S2S and S4S) Rough	Finished	*Hardwoods* Rough	Surfaced 2 Sides
1"	25/32"	3/8"	5/16"
1¼"	1 1/32"	1/2"	7/16"
1½"	1 13/32"	5/8"	9/16"
1¾"	1 19/32"	3/4"	11/16"
2"	1 13/16"	1"	1 1/16"
2½"	2 3/16"	1¼"	1 5/16"
3"	2 3/4"	1½"	1 9/16"
4"	3 3/4"	2"	1 3/4"
		2½"	2 1/4"
		3"	2 3/4"
		3½"	3 1/4"
		4"	3 3/4"

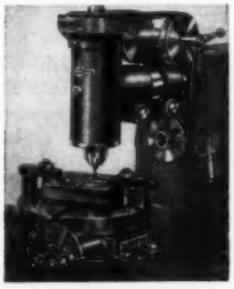
STANDARD LENGTHS:

Softwoods
6′ or longer in multiples of 1′ and 2′

Hardwoods
4′ to 16′ in multiples of 1′

NOW AVAILABLE FOR SCHOOLS!

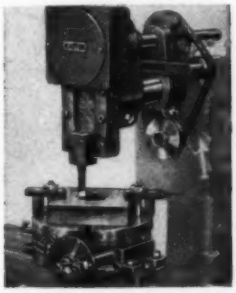
MARVIN *Machine Tool Attachments*



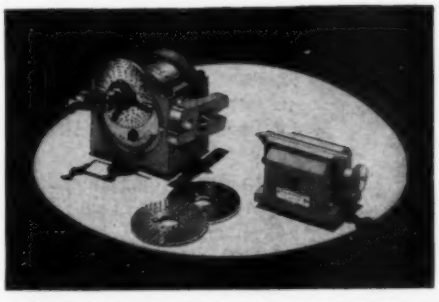
MARVIN VERTICAL MILL ATTACHMENT. No. V-1200, a Head combining simplicity and high performance with low cost. This Marvin *Head can be set at angles,* pulled out far past the travel of the table for large overhanging work. Simple to attach. Has a heavy spindle equipped with Timken tapered roller bearings which assures smooth operation at high speeds. Spindle nose takes end mills with ⅜" straight shank, up to ½" diameter cutter. Unit is machined to slip over 1½" overarm. Easily adapted to other size overarms. Height 7½". Price $65.00.

MARVIN ROTARY INDEX TABLE. No. 7-1102. A strong rigid precision table at a moderate price.

The 6" table is graduated in degrees and has "T" slots for ⅜" bolts, with a bushing in the center. Table locks from the bottom. It cannot tilt. Cast iron worm wheel, hardened and ground worm (40:1 ratio). Worm can be disengaged. 3 index plates with 6 sets of holes each give a wide range of divisions. Hand wheel also furnished, graduated in ½ degrees. Height 2⅝". Price $93.00.



MARVIN SLOTTING ATTACHMENT. No. S-1070. The Marvin Slotter can be quickly mounted. *It can be set at angles to get draft on dies,* etc. Can be pulled out past the travel of the table to handle large overhanging work. The stroke is adjustable from 0" to 2". Holder takes tools having ½" shank, machined to fit 1½" overarm by using a bushing or turning down a special overarm. Height is 7½", width 4½". Machines dies, squared or splined holes, internal gears, etc. Price $82.00.



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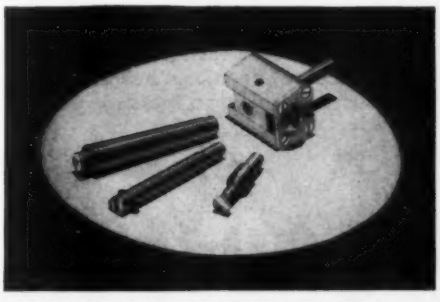

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LUMBER

(Continued from page 36A)

As previously stated, however, many lumber associations have their own grading rules. (See Table of Standard Gradings.)

Grade A Select is a clear wood suitable for finish work. Grade B Select may contain minor blemishes, such as pin knots, small checks, stain, or the like, which do not detract from its quality. Many manufacturers do not recognize the differences in quality of grades *A* and *B*, and combine them to be sold as *B* or better. These select grades are suitable for natural finish. The *C* and *D* select grades are suitable for paint finish and are less expensive for shopwork.

The *Common* grades or *Board* grades permit knots, pitch pockets, shakes, stain, and other defects in a greater or lesser degree, depending on the grade of wood.

It is suggested that No. 1 and No. 2 clear sugar pine be used for carving because of its soft uniform texture, straight grain, and its freedom from pitch.

The Western Pine Association marks each piece of lumber with the Association mark, mill identification, grade name, and species mark. This official stamp may be requested in the written specifications.

Third, for cabinetwork or patternmaking the lumber should be kiln dried to 6 per cent moisture content. As a further precaution, the following can be indicated: Lumber must be free from internal stresses, seasoning defects, and dried to proper and uniform moisture content.

Thickness should be given in niches: both rough dimensions and finished thickness if surfaced. (See Table of Standard Gradings.)

If the lumber is to be dressed, it should be indicated as

S1S, surfaced 1 side
S2S, surfaced 2 sides
S4S, surfaced 4 sides, etc.

If special widths are desired, the nominal specified.

If a particular length is desired, it should be so specified (e.g., no boards under 6 ft. or over 12 ft). (See Table of Standard Gradings.)

A typical order for soft wood should read: 200 bd. ft. supreme (*B* and better) Idaho white pine, random widths, 1″ thick S2S to 25/32″ no boards over 12′ long, kiln dried.

The rules governing standards for grading hard wood lumber in the United States are those adopted by the National Hard-

[1]"National Hardwood Lumber Association Rules," published by National Hardwood Lumber Association, 59 East Van Buren Street, Chicago 5, Ill. (25 cents).

wood Lumber Association.[1] Grade classifications are determined by the yield of material clear on one side that can be cut from a piece of lumber, but not less than a certain size. These pieces are termed "clear cuttings" and must have one face clear and the other sound, that is, free from any defects that will impair the strength of the cutting.

The two highest grades of hardwood are known as "Firsts" and "Seconds" and are generally combined as one grade (1s and 2s or Fas). The third grade is termed "Selects," followed by No. 1 common, No. 2 common, sound wormy, No. 3A common and No. 3B common. The lengths and widths for the various grades are also standardized.

Firsts and seconds — "widths: 6" and wider. Lengths: 8′ to 16′ admitting 30 per cent of 8′ to 11′ of which one half may be 8′ and 9′."[2]

Selects — "Widths: 4" and wider. Lengths: 6′ to 16′ admitting 30 per cent 6′ to 11′ of which one sixth may be 6′ and 7′."[3]

A typical order for mahogany would be as follows: 500 bd. ft. plain African (Khaya) mahogany, Fas, 1" thick S2S to 13/16", random widths, lengths 6′ to 16′, kiln dried.

It must be noted that mahogany is divided into a number of species, generally named after the locality from which they come.

1. West Indian Mahogany (Swietenia mahagoni) — from Cuba and Santo Domingo.
2. Tropical American Mahogany (Swietenia macrophylla) — from Honduras, Mexico, Nicaragua, and Guatemala.
3. African Mahogany (Khaya) — from Gold and Ivory Coasts of Africa.
4. Philippine Mahogany — from Philippine Islands.

The first three are true mahogany, therefore, it becomes necessary to specify the type of mahogany desired, using the botanical terms. If a figured grain is desired, which especially may be true when ordering quartersawed oak, it should be so specified (e.g., plain, figured, stripe, quartersawed).

Since hardwoods are sawed to obtain clear cuttings, variable lengths are available and are termed "shorts." They are graded in lengths from 2 ft. to 5 1/2 ft. in multiples of 3 in., the narrowest width being 4 in. for firsts and seconds. Shorts being less expensive may be very desirable for school use.

[1] *Ibid.*, p. 19, Para. 53 and 54.
[2] *Ibid.*, p. 20, Para. 64 and 65.

(Continued on next page)

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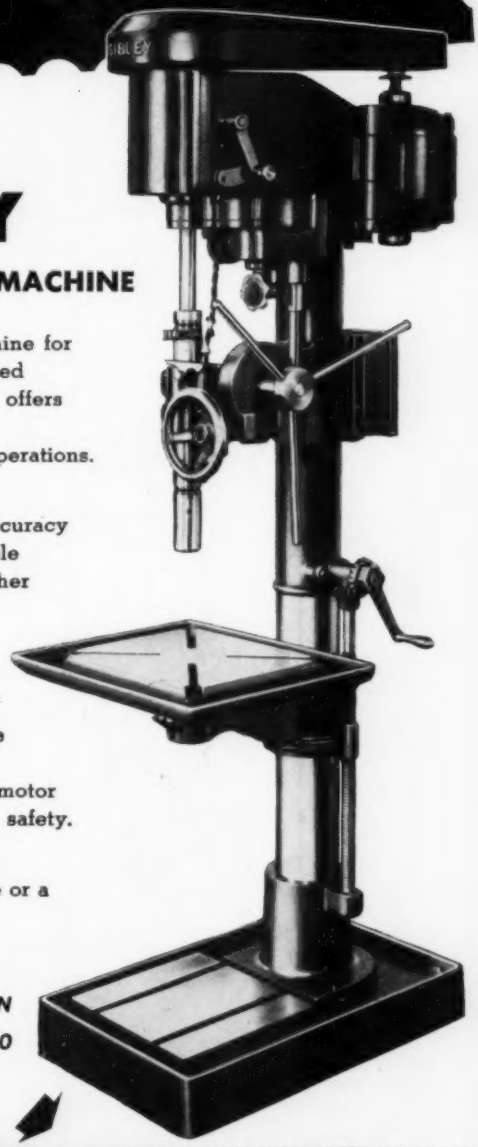

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LUMBER

(Continued from previous page)

An order for walnut shorts should be stated as follows: 500 bd. ft. American black walnut, firsts and seconds, shorts, 1" thick S4S to 13/16", kiln dried, free of sapwood. National rules to govern, or "The Lumber is to be Inspected according to the rules and regulations of the National Hardwood Lumber Association by a national inspector."[4]

When the latter is in evidence a licensed and bonded inspector will inspect the lumber and issue a bonded certificate, for a standard fee plus charges for special or unusual services.

[4] *Ibid.*, p. 7.

Descriptive Geometry for Industrial-Arts and Vocational-Trade Drawing

WEBSTER M. CHRISTMAN, JR.
Assistant Professor of Engineering Drawing and Descriptive Geometry
University of Wisconsin
Milwaukee Extension Division

Descriptive geometry embraces all the basic and advanced theory of the subject of orthographic projection. Yet today there must be hundreds of industrial-arts and vocational-industrial drawing teachers who had never had a course in the subject either as an undergraduate, an "in-service," or a graduate student. This statement is based on the responses to a single question addressed to the proper departments in twenty of the leading colleges and universities having curricula in either or both industrial arts and trade and industrial education.

"Do you offer a course in descriptive geometry as part of your training in drawing?" was the question. Every part of the United States was represented by the colleges which were contacted. Seventeen of the twenty replied. Seven of the colleges offer courses; some for industrial-arts students only, some for T & I only, some for both. The data from so small a sampling cannot be considered conclusive it is true, yet coupled with first-hand knowledge of five other teacher-training institutions where no instruction in descriptive geometry is available, the data are at least significant. They signify that a gap exists in the training of industrial arts and vocational education drawing teachers that should be filled somewhere along the line of training, either in classes on campus or by extension courses.

Studying a good solid course in descriptive geometry would round out more completely one's training in the *language of industry*. Surely the obtaining of a thorough background for mastery of a subject is a worth-while objective. True, the junior high school general shop teacher may find no daily need for the complete theory of projection drawing as he goes about teaching the drawing unit in a shop embracing four or five activities. The top, front, and right side or right end principal views, plus a certain amount of theory on sectional and auxiliary views will suffice. But the teachers in high schools and trade schools could find many new opportunities to use the material learned in descriptive geometry. Isn't it true that other things being equal, the more complete one's education and training is in a subject matter area, the better job of teaching even elementary subjects one can do? In a good school system it would be hard to find a junior or senior high school mathematics teacher whose training had not extended at least through the calculus. The physics and chemistry teachers also have had work beyond what they need to know to teach at the high school level. Pythagorus said, "He who knoweth not what he ought to know is a brute beast among men; he that knoweth no more than he hath need of, is a man among brute beasts, and he that knoweth all that may be known, is a god among men." While we may not hope to attain the last condition, the fact that many teachers constantly engage in higher studying shows that we do not wish to

(Continued on page 43A)

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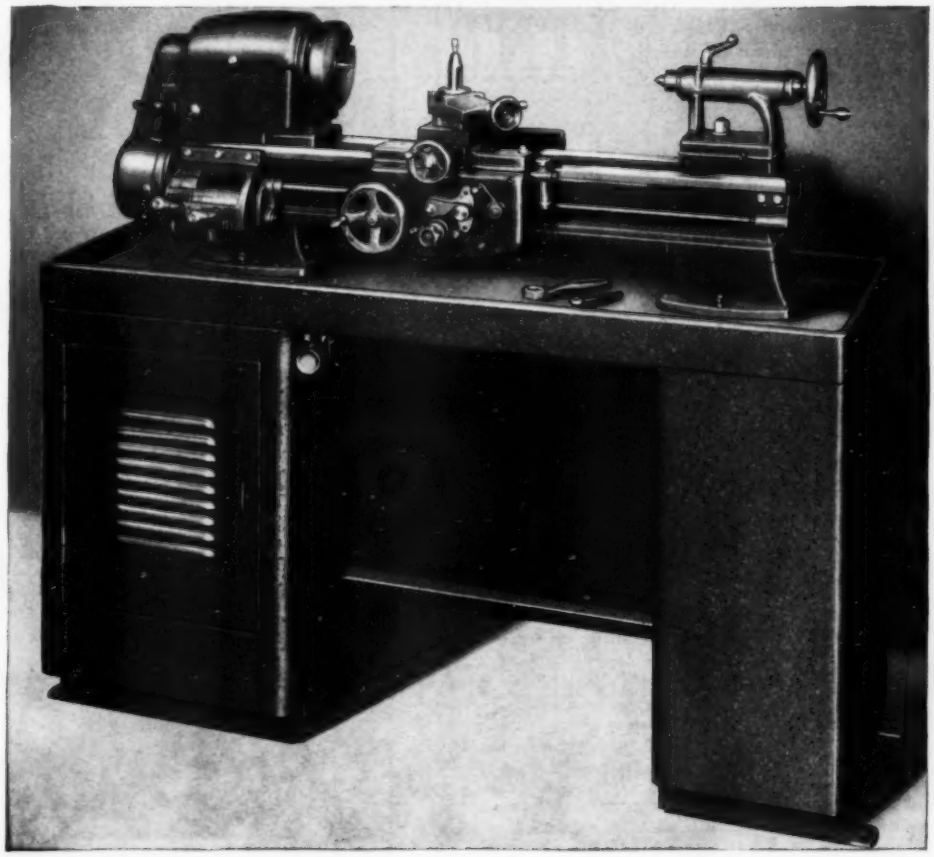

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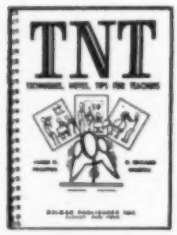

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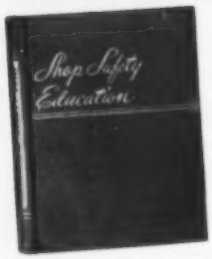

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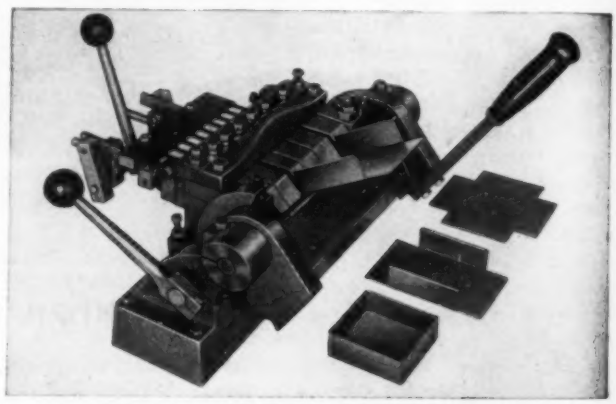

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DESCRIPTIVE GEOMETRY

(Continued from page 40A)

remain in the second classification of knowing no more than we "hath need of" to get by. Thus it seems that a better comprehension of the subject of projection drawing, a greater facility for adapting its subject matter to your own teaching, as well as the gaining of a greater dignity and respect for your subject of mechanical drawing in the eyes of other departments as a result of your having taken advanced work, are several of the worth-while professional outcomes of studying a course in descriptive geometry.

Uses for Industrial-Arts Teachers

What are some of the ways industrial-arts drawing teachers can use the information gathered in a descriptive geometry course? One of the first that comes to mind is in the teaching of auxiliary views. High school graduates who have had from two to four semesters of drawing generally have a good knowledge of top, front, and right side view drawing, a fair facility for handling sectional views if confined only to full sections, and a notably weak "know-how" in dealing with auxiliary views. This is a conclusion based on personal experience with a good many high school graduates in industry as well as from testing others who, feeling that they had had enough high school mechanical drawing, applied to take the information examinations to see if they could be excused from the first course in college. This apparent weakness isn't due to a lack of time to cover auxiliary views in the high school courses, for the same students can show you drawings of cams, gears, and sometimes even small gasoline engines. These take much time to draw. It seems reasonable to believe that if high school teachers had a good strong background in auxiliary views the pupils they teach would get more training in this important basic subject matter. No criticism of the teachers is inferred by that statement. This seemingly weak spot in their training can often be traced right back to the teacher training institutions in at least two ways. First, where the industrial-education department is located at a university that has an engineering school. Here the future teacher generally takes his drawing work along with the future engineers. Many first courses in collegiate-grade engineering drawing cover auxiliary views only briefly or even not at all because the engineering students will get such work later on in descriptive geometry. If the "Industrial Eds" do not elect this later course they therefore lose out on a good solid training in auxiliary views.

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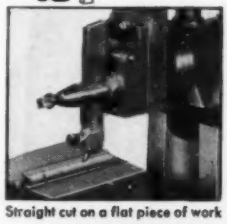
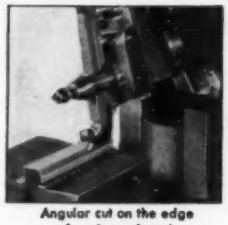
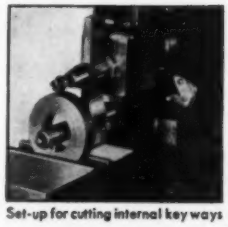


Straight cut on a flat piece of work



Angular cut on the edge of a piece of work



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Secondly, in teacher training schools where the industrial-education department handles its own drawing courses the coverage on auxiliary views is too often insufficient for those who will in the future be instructing unit courses in high school drawing. This is true for the same reason given above, that most general drawing textbooks do not cover the subject of auxiliary views completely. And in this second group of schools descriptive geometry isn't even offered on the campus. So whatever the reason may be for it, it seems to me that more time would be given to auxiliary views in high school drawing courses if instructors knew more about the subject. The best way to obtain a thorough training is through the study of a good course in "descript."

In many high schools it is possible for a boy or girl to take two and sometimes three drawing courses simultaneously after completing the first course. In such cases enough skill is developed and enough technical information is acquired to give the student a good degree of employability even though the work is taught on a unit

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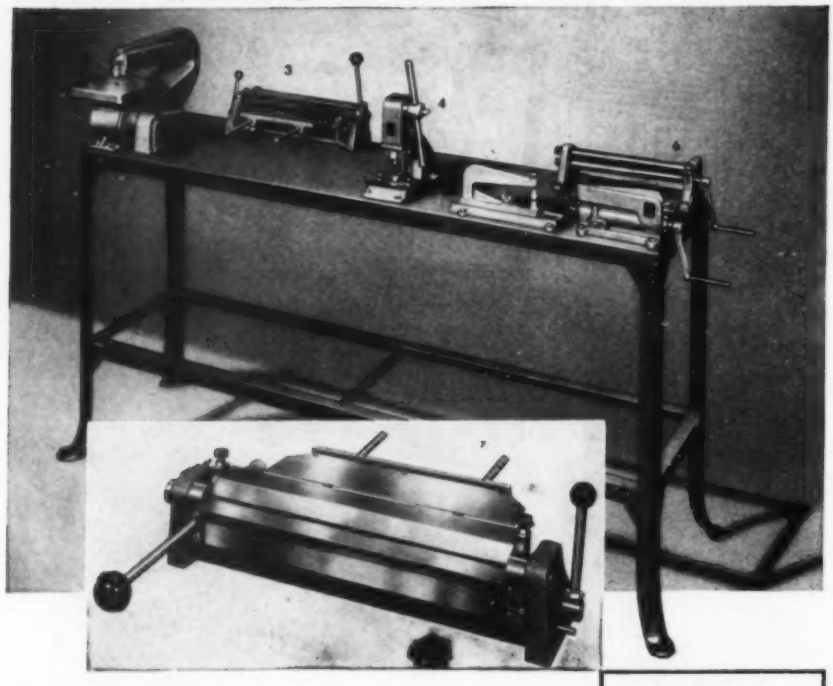

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DESCRIPTIVE GEOMETRY

(Continued from previous page)

industrial-arts basis rather than on a trade training basis. For teachers of such courses descriptive geometry will provide material that can be applied to some extent in much the same way as will be suggested later on for trade training and related drawing teachers.

From the exploratory and tryout angle there are some interesting possibilities. Every year teachers have the experience of having a few exceptionally alert and capable pupils — pupils well above the average. Instead of having them draw more gears, more cams, or instead of assigning them the job of helping slower pupils as is sometimes done, or instead of having them draw a second set of house plans, or instead of having them do any of the many other things we know they are at times given to do, wouldn't it be fine to be able to give them an experience involving the application of drawing to things other than the typical sheet metal, machine drawing, or house plan work? For the very mechanically interested boy or the college-bound engineering student why not a simple problem with rolling hyperboloids as applied to skew hypoid gears? Let him find out how the hypoid gear surfaces are obtained. You can build such a problem so that it will involve only one auxiliary view for each hyperboloid thus keeping it within the ability range of a high school pupil. For those localities where mining is an industry there are problems on veins, outcrop, faulted veins, mine dumps, and rock strata. These involve contour maps, an understanding of such terms as bearing, strike, and dip, and the use of single auxiliary views. Highway problems involving cut, fill, and grading should be of interest in any locality because everyone rides on highways. In this age of streamlined electric mixers, airplanes, boats and ships, refrigerators, automobiles, and railroad locomotives and cars, the teacher who knows something about fairing double-curved surfaces, even though he may be able to impart such knowledge to only a few pupils "has something." When very capable members of the class work on special "advanced" projects it sometimes is the means of inspiring others to high accomplishments, isn't it? The industrial-arts teacher who is continually on the alert to bring out the best that is in every pupil will see in these few suggestions the possibilities for many more new ideas that can be injected into high school drawing courses of an advanced nature.

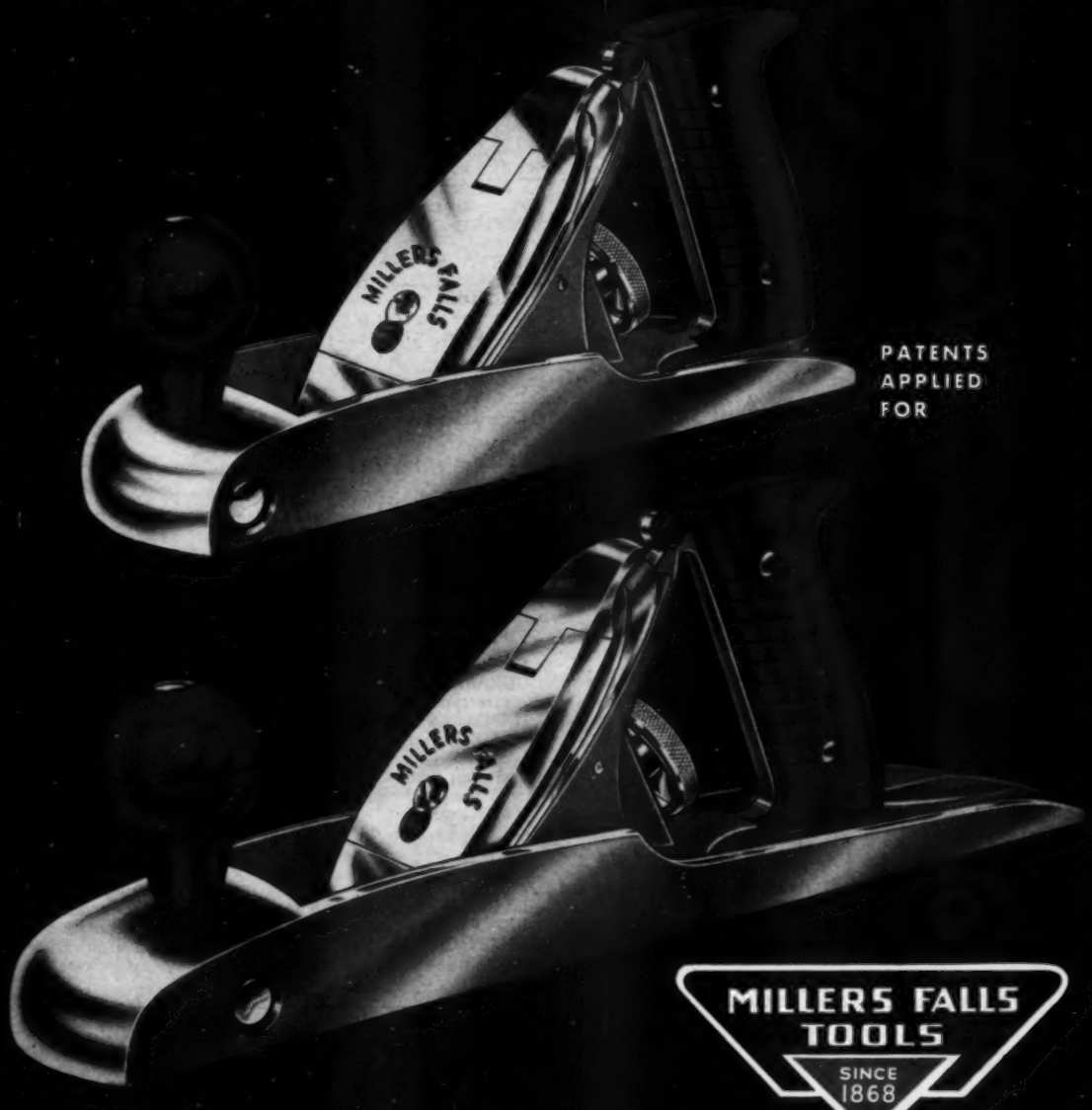
Some Practical Applications for Trade Teachers

The broad knowledge for practical application that a drawing teacher must have is implied in the very name by which his subject is known — the language of industry. Descriptive geometry has much to offer trade training and related drawing teachers by way of acquainting them with the manner in which the subject matter may be put to practical use.

Sheet-metal drafting and layout is one of these areas. Examine the textbooks that touch upon the subject and you will see that they provide a good coverage on the type of pipes, ducts, or shapes whose axes are parallel with the principal planes of projection. In order to draw the lines of intersection and make the flat pattern layouts of objects having oblique axes you will have to look to the descriptive geometry textbooks. No one will deliberately choose the position of an object so its axis will be oblique but at times there is no choice. On one of the large military cargo planes in use today it was decided to have an anti-icing system using air heated by engine exhaust gases instead of the up-to-then conventional de-icing system employing air forced into rubber *over-*

(Continued on page 46A)

The Finest Planes in the World



PATENTS APPLIED FOR

MILLERS FALLS TOOLS
SINCE 1868

Sorry! You won't find these streamlined beauties in Millers Falls new No. 49 Catalog just off the press last month. They are that brand, spanking new. • We think they are the handsomest, smartest looking hand tools ever produced. One thing we are very certain of. Feature by feature, they are the finest planes ever made. • If you believe fine tools help make fine craftsmen . . . if you want your students to work with the very latest and best — then you'll want these two new planes in your shop quick. Order from your supplier's today. And don't forget — we have a FREE copy of Millers Falls new 172 page Catalog No. 49 waiting for you. Just drop us a postcard and we'll send it along.

MILLERS FALLS COMPANY • GREENFIELD, MASSACHUSETTS

Automotive Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

AIR COMPRESSOR
- *a*) 3 to 4 cu. ft., with tank, piping, and motor
- *b*) Small portable, 1 cu. ft., with motor

ALIGNING JIG — for connecting rods

ANVIL
- *a*) No. 100 or No. 125
- *b*) Rim

ARMATURE GROWLER AND TESTER

AXLE STANDS

BATTERY EQUIPMENT
- *a*) Cell tester, panel type with discharge rack
- *b*) Charger (15-battery size) with rack
- *c*) Charger (6-battery size)
- *d*) Gas stove (small)
- *e*) Lead-burning torches, with gauges and piping
- *f*) Plate racks

BENCH
- *a*) Electric test, elaborate
- *b*) Electric test, simple
- *c*) Work, with vises
- *d*) Work, portable with vise

BLACKBOARD

BLOWTORCHES — 1-qt. size

BOOKCASE

BRAKE
- *a*) Adjusting stand
- *b*) Band-lining machine

BULLETIN BOARD

CABINETS
- *a*) Wood or metal, for bolts and supplies
- *b*) Wood or metal, for filing job sheets and correspondence

CHAIN HOIST — with overhead trolley and track

CHAIRS
- *a*) Teacher's
- *b*) For tables, or with tablet arms

CRANE — portable

CRANKSHAFT TRUING TOOL

CREEPERS

DESK — teacher's

DRILL
- *a*) Breast
- *b*) Hand
- *c*) Electric portable, ⅜ in.
- *d*) Electric portable, ¼ in.
- *e*) Press, 21 in., with motor and chuck

DYNAMOMETER — electric

FORGE — with blower and tools

FURNACES — gas

GREASE DISPENSERS

GRINDER
- *a*) Cylinder with motor
- *b*) 8 in., with motor
- *c*) 12 in., with motor

HONES — cylinder

JACKS
- *a*) Lever, 1½-ton
- *b*) Floor, roller

LATHE
- *a*) 11 in. by 4 ft., with motor, chucks, and attachments
- *b*) 16 in. by 6 ft., with motor, chucks, and attachments

PRESS
- *a*) Arbor
- *b*) 30 ton

SPRAY PAINTING OUTFIT

VALVE REFACING MACHINE

VULCANIZER
- *a*) Electric steam for tube work
- *b*) Small, hand

WELDING OUTFIT — with tanks, gauges, and cutting torch

WHEEL ALIGNMENT
- *a*) Gauge
- *b*) Test table

Automotive Shop—Small Tools

ABRASIVE — rubstone for cleaning castings in foundry

ALCOHOL TESTER

BATTERY
- *a*) Cell tester, prod type
- *b*) Cell tester, cadmium
- *c*) Clips, large
- *d*) Element pullers
- *e*) Fillers
- *f*) Funnels, glass
- *g*) Hydrometer, acid
- *h*) Knives
- *i*) Post builders
- *k*) Post drills
- *l*) Post markers
- *m*) Separator trimmer

BITS
- *a*) Expansive
- *b*) Ratchet brace
- *c*) Wood, 3/16 in. to 1 in.

BOLT CUTTER — 24 in. and 36 in.

CALIPERS — 6 in. inside and outside

CANS
- *a*) Oil, 1/3 pt.
- *b*) 1 gal., gas, safety
- *c*) 5 gal., gas, safety
- *d*) 5 gal., kerosine
- *e*) Waste

CHECKS — tool, 1000, blank

CHISELS
- *a*) Cape, 3/16 in. and 5/16 in.
- *b*) Cold, 3/16 in., 5/16 in., 3/4 in., 1 in.
- *c*) Diamond point

COMBINATION SQUARES — 12 in.

COTTER-PIN EXTRACTOR

DIVIDERS — 6 in. and 10 in.

DRILL SETS
- *a*) 1/32 in. to ½ in., by 64ths
- *b*) ½ in. to 1¼ in., by 32nds

FILE CARDS

FILE HANDLES — assorted

FILES
- *a*) Flat bastard, 6 in., 8 in., 10 in., and 12 in.
- *b*) Half round, 6 in., 8 in., 10 in., and 12 in.
- *c*) Mill, 6 in., 8 in., 10 in., and 12 in.
- *d*) Round, 6 in., 8 in., 10 in., and 12 in.
- *e*) Square, 8 in., 10 in., and 12 in.

FIRE EXTINGUISHERS — Pyrene and Acid

FIRST-AID CABINET AND SUPPLIES

FLOOR BRUSHES — 18 in.

FUNNELS — tin, assorted sizes

GAUGES
- *a*) Air pressure
- *b*) Center
- *c*) Depth
- *d*) Thread
- *e*) Thickness

GLASS CUTTERS

GOGGLES

GREASE GUNS — plain and pressure type

HAMMERS
- *a*) Ball peen, 4 oz.
- *b*) Ball peen, 1¼ lb.
- *c*) Ball peen, 2 lb.
- *d*) Lead
- *e*) Riveting
- *f*) Sledge, No. 12

LADLE
- *a*) 3-in. bowl
- *b*) 6-in. bowl

LAMPS — extension, with reels

LEAD POT — gas

MAGNET CHARGER

METERS — volt and ammeter test

MICROMETERS
- *a*) Outside, 0 to 1 in.
- *b*) Outside, 2 in. to 3 in.
- *c*) Outside, 3 in. to 4 in.
- *d*) Inside, 1½ in. to 6 in.

MOLDS
- *a*) Battery nut
- *b*) Battery post
- *c*) Battery strap
- *d*) Burning stick
- *e*) Lead hammer

OILSTONE

PIPE TAPS — 3/8 in., ¼ in., 3/4 in., and ½ in.

PLIERS
- *a*) Combination, 6 in.
- *b*) Flat nose
- *c*) Roundnose

PULLERS
- *a*) Bearing
- *b*) Gear
- *c*) Wheel, hub type

PUNCHES
- *a*) Center
- *b*) Taper pin
- *c*) Blacksmith

PUTTY KNIVES

(Continued on page 48A)

DESCRIPTIVE GEOMETRY

(Continued from page 44A)

shoes on leading edges of surfaces to break up ice already formed. Much of the design of the airplane was completed when the decision on an anti-icing system was made. It was laid out on the basis of putting it in wherever there still was room to get through. On the production models later on the design was cleaned up. As a result, the ducts were circular, square, and rectangular, zigging this way and zagging that way — all oblique axes. Not one section had its axis parallel to a principal plane!

The statement above about the amount of coverage on the subject in general textbooks is not a criticism. The authors themselves, often in footnotes, do tell you to see a good descriptive geometry text for a thorough study of the subject. And then many of the teacher training schools do not provide this advanced course.

Where house planning courses are taught that go beyond floor plans and elevations there are some applications. While many carpenters are capable of using the steel square to lay out angular cuts for rafters these angles may be laid out, measured, and dimensioned on the drafting board so that they may be cut by anyone even though they have incomplete framing square experience. Perspective drawing and shades and shadows drawing, both used in the delineating of pictorial views of houses and buildings, find their basic theory in descriptive geometry. The circular stairway and the winding ramp are both applications of the helicoid, a warped surface. The spiral chute whether for packages or fire escape is a helicoid also. The business of stone layout for cutting and fitting (stereotomy) is closely allied with architectural drawing. Within the past year there have been two advertisements in a large city newspaper for draftsmen with *stone layout* experience. There is a recent case where a quarry accepted the contract to furnish the material for a bridge with an ornamental archway of cut stone. The point of difficulty was that it was a skew bridge. When the quarry people found

(Continued on page 50A)

Snap-on Tools

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teach your students to use them NOW!

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☐ **Please send FREE Catalog**
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School Division

SNAP-ON TOOLS CORPORATION
8074-C 28th AVENUE KENOSHA, WISCONSIN

(Continued from page 46A)

REAMER — spindle bolt
REAMER SETS
- *a*) Piston pin, ½ in. to 1⅜ in.
- *b*) Taper pin
- *c*) Valve seat

SAWS
- *a*) Hack, frames, 10 in., adjustable
- *b*) Hack-saw blades, 18, 20, and 24 teeth
- *c*) Hand

SCALES
- *a*) Steel, 6 in., graduated 1/64 and 1/100 in.
- *b*) Steel, 12 in., graduated 1/32 in.

SCRAPERS
- *a*) Bearing
- *b*) Carbon

SCREW DRIVERS
- *a*) 6 in. and 12 in.
- *b*) Small combination

SCREW EXTRACTORS
SCRIBERS
SNIPS — tin, 3 in. straight and 3 in. curved
SOLDERING COPPERS — 1, 2, and 3 lb. with handles
SPRING SPREADERS
STAMPS
- *a*) Figures, 3/16 in.
- *b*) Letters, 3/16 in.

TAP-AND-DIE SETS
- *a*) Machine screw
- *b*) N.F. ¼ in. to 1 in.
- *c*) N.C. ¼ in. to 1 in.

TIRE TOOLS
TOOL KIT — metal box or canvas roll, empty
TWIST DRILLS — (extra sets) selected sizes
VALVE
- *a*) Grinders (hand)
- *b*) Spring lifters

WRENCHES
- *a*) 8 in., 10 in., 12 in., and 18 in.
- *b*) Ignition sets
- *c*) Pipe, 10 in., 14 in., 16 in., and 18 in.
- *d*) Rim socket
- *e*) Socket sets, large assortment with case
- *f*) Spark plug
- *g*) Speed wrenches
- *h*) Standard end sets, ¼ in. to ⅞ in., N.C. and N.F.
- *j*) Valve-tappet wrenches

Automotive Shop— Materials and Supplies

ABRASIVE CLOTH AND PAPER — aluminum oxide and silicon carbide
ACETYLENE GAS — in drums, for welding
ACID
ALCOHOL
BABBITT
BEARING BLUE
BEARING COMPOUND
- *b*) 600W
- *c*) Penetrating

BOLTS
- *a*) Machine, selected sizes
- *b*) N.F. selected sizes
- *c*) Stove, flat or round heads, selected sizes

BRAKE JUICE — ½-pt. cans
BRUSHES
- *a*) Paint
- *b*) Spark plug
- *c*) Spoke
- *d*) Steel
- *e*) Varnish

CHAMOIS
COIL-SPRING ASSORTMENT
COPPER TUBING
COTTER PINS — assorted sizes
CROCUS CLOTH
DISTILLED WATER
DRAIN COCKS
ELECTROLYTE
ENAMEL — AUTO PAINTING
GASKETS
- *a*) Copper asbestos
- *b*) Cork and felt
- *c*) Flange

GASOLINE
GREASE — cup, cans
KEROSINE
KEYS, WHITNEY — assorted
LACQUER — colors
LEAD
LUBRICANT — transmission
NAILS AND BRADS
NUTS
- *a*) N.F., castellated, square, hexagon, selected sizes and kinds
- *b*) N.C., square and hexagon, selected sizes
- *c*) Machine screw, selected sizes
- *d*) Wing, selected sizes

OIL
- *a*) Cylinder, light, medium, and heavy

OXYGEN — in drums for lead burning
PIG LEAD
PISTON-RING COMPRESSORS
RADIATOR HOSE
RIVETS — brake lining, 5/16 in., ½ in., and ¾ in. long.
SCREWS
- *a*) Flathead or roundhead, iron or brass, selected sizes and kinds
- *b*) Cap and machine, iron, or brass, selected sizes and kinds

SEALING COMPOUND
SHELLAC — ½-pt. cans
SHIM STOCK
SOAPSTONE
SOLDER — bar, wire, or self-fluxing wire
SOLDERING PASTE
SPELTER — for brazing
SPONGES — ½ lb.
STARTING CABLE
TACKS AND STAPLES — upholstery
TIRE
- *a*) Carcass fabric
- *b*) Cushion stock
- *c*) Inner-tube repair stock
- *d*) Patching cement
- *e*) Patches
- *f*) Putty
- *g*) Tread stock
- *h*) Vulcanizing

VALVE-GRINDING COMPOUND — coarse and fine
WASHERS
- *a*) Lock, assorted sizes
- *b*) Wrought iron

WASTE
WIRE — primary and secondary

NEW EDUCATIONAL AMPLISTAT

to help teach magnetic amplification

With the new G-E educational amplistat, your students will readily grasp the fundamental principles of the use of saturable reactors in magnetic amplification.

The amplistat is one of the outstanding electrical developments of recent years. The educational amplistat has been designed for clear, effective illustration of magnetic amplifier principles in lecture demonstrations and laboratory experiments.

You can readily set up the unit with other standard laboratory equipment to perform these and other basic types of experiments:

Voltage and current regulation of small generators, motor-speed control, operation of positioning systems, totalizing and recording on one instrument the current in several independent circuits, principles of d-c current transformers and saturable reactors.

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HIGH POWER GAIN—amplifies up to 25,000 times

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EASY TO DEMONSTRATE—schematic diagram moulded into panel surface. Connections brought out to 18 terminals.

CONVENIENT—operates from 115-volt, 60-cycle line. The educational amplistat consists of a saturable reactor and rectifiers mounted in one unit. It requires no warm-up time and has no moving parts.

For further information write for GEC-599 to Apparatus Dept., Section 687-28, General Electric Co., Schenectady, New York.

Special net educational price **$50**

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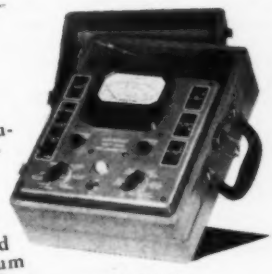
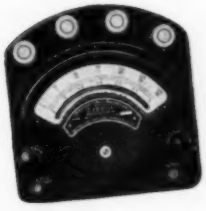
ELECTRONIC ANALYZER

Three-in-one instrument. Provides self-contained Volt-Ohm-Milliammeter, high impedance electronic Volt-Ohmmeter, and probe type Vacuum Tube Voltmeter for use to 300 megacycles.



Model 769



Model 280

D-C MINIATURE INSTRUMENTS

Single and multi-range voltmeters, ammeters, voltammeters available. Accuracy within 1%. Hand calibrated scales. Knife-edge pointers, mirrored scales eliminate parallax errors.

SUPER-SENSITIVE ANALYZER

Volt-Ohm Milliammeter, 26 ranges, temperature compensated, D-C voltage ranges have either 1000 or 20,000 Ohms per volt sensitivity. Precision resistors used throughout. Solid oak carrying case. Small, light, compact.

Model 779

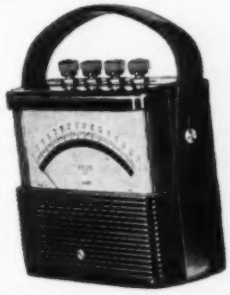
Model 697

VOLT-OHM-MILLIAMMETERS A-C D-C

Carefully selected group of ranges for A-C, D-C voltage measurements, direct current and resistance values. 1000 Ohms per volt sensitivity. Self-contained battery . . . equipped with test leads.

D-C PORTABLE INSTRUMENTS

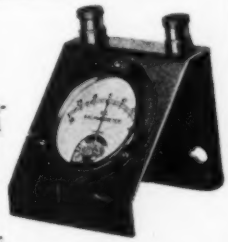
Highly shielded single and multi-range voltmeters, ammeters, milliammeters and microammeters. Temperature compensated . . . hand calibrated mirror scales. Accuracy within ½ of 1%.



Model 931

STUDENT GALVANOMETER

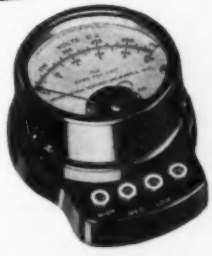
Available with or without base. Widely used in school instruction where dependability and low cost are paramount. Sensitivity: 22 microamperes. Resistance: 23 Ohms. Scale: 30-0-30. Medium and extreme sensitivity models also available.



Model 375

D-C MINIATURE PORTABLE INSTRUMENTS

Rugged, serviceable for all-around use. Available in single, double, and triple ranges for voltage measurements; single and double ranges for current measurements. Accuracy 2%.



Model 489

WESTON INSTRUMENTS

Electrical-Shop Equipment, Supplies, and Motor Testing Equipment

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

BENCH GRINDER
BENCHES — plain or with drawers, for tools and equipment, or with compartments for the storing of wiring panels. Preferably they should have electrical outlets
BITS
- *a*) Auger, ¼ in. to 1 in. by 16ths
- *b*) Auger, 11/16 in., 18 in. long
- *c*) Drill, for wood, square shank, ⅛ in. to ½ in. by 16ths
- *d*) Expansion
- *e*) Extension, 18 in.
- *f*) Screw driver, ¼ in.

BLACKBOARD — permanent or portable
BLOWTORCHES — 1-qt. size
BOOKCASE
BRACES — ratchet type, 8-in. swing
BULLETIN BOARD
CABINETS — wood or metal for filing class records, instruction sheets, drawings, etc.
CHAIRS — teacher's and tablet arm
COMPASS SAW
COIL
- *a*) Spreader
- *b*) Taper
- *c*) Winder

DESK — teacher's, with drawer compartments
DRILL
- *a*) Breast
- *b*) Concrete, ⅜ in., ½ in., ¾ in., 1 in.
- *c*) Hand
- *d*) Portable, electric
- *e*) Twist, 1/32 in. to ⅜ in. by 32nds

DRILL PRESS
- *a*) Bench, hand, or power driven
- *b*) Heavy, power driven

FILES
FIRST-AID CABINET AND SUPPLIES
HACK SAW
- *a*) Blades, 10 in., 24 tooth
- *b*) Frames, adjustable

HAMMERS
- *a*) Claw, 12 oz.
- *b*) Machinist's, ball peen

HICKEY — ½ in. and ¾ in.
LATHE
- *a*) Engine, 10-in. or 12-in. swing, 6 ft. or 8 ft. long
- *b*) Speed

PLIERS
- *a*) Gas, 6½ in. and 8 in.
- *b*) Side cutting, 6 in.

PUNCH — for metal molding
PUNCHES — assorted
REAMERS
- *a*) Pipe burring, ¼ in. to 1 in.
- *b*) Pipe burring, ½ in. to 2 in.

RULES
- *a*) 48 in. zigzag
- *b*) 72 in. zigzag

SCREW DRIVERS — 3 in., 5 in., and 8 in.
SHEARS — for cutting metal molding
SOLDER DIPPERS
SOLDERING COPPERS
- *a*) Assorted
- *b*) Electric
- *c*) Handles

STOCKS AND DIES — for pipe threads, ½ in. to 1 in.
VISES
- *a*) Machinist's, 4 in.
- *b*) Pipe

WRENCHES
- *a*) Adjustable, 6 in. and 8 in.
- *b*) Pipe, 10 in., 12 in., and 14 in.
- *c*) Socket, combination

Electrical Shop—Supplies

ABRASIVE CLOTH — Aluminum oxide, 1, 1½, and 2 in. wide
ARMORED CABLE
- *a*) 2 wire, No. 14, single strip
- *b*) 3 wire, No. 14, single strip
- *c*) Box connectors

ATTACHMENT PLUG
BAR HANGERS
BATTERIES — dry cells
BATTERY ACID — 1.300
BATTERY SEALING COMPOUND
BOX CLEATS
BRADS — ¾ in., No. 19, and 1½ in., No. 16
BRAKE LINING — ¼ by 2 in.
BRUSHES — carbon, for motors and generators
BURGLAR CONTACTS
- *a*) Open circuit
- *b*) Closed circuit

BUSHINGS
- *a*) Loom, No. 1 and No. 2
- *b*) "Jiffy" loom No. 2

BUZZERS
CLEATS — unglazed porcelain, 2 wire
CLIPS — test, with insulators, Universal, Nos. 22, 23, 24, and 25
COMMUTATOR CEMENT
CONDUIT
- a) Bushings, ½ in., ¾ in., and 1 in.
- *b*) Box connectors, for flexible
- *c*) Couplings, for flexible
- *d*) Lock nuts, ½ in., ¾ in., and 1 in.
- *e*) Rigid, ½ in., ¾ in., and 1 in.

CONDULET
- *a*) Fillings, ½ in., LL, LR, and LB
- *b*) Covers, ½ in., blank

DOOR OPENERS — mortised
FISH PAPER — .0125 in. thick
FIXTURES — brass chain, suspension
FIXTURE STUDS
FUSES
- *a*) Plug type, renewable, 125 volt, 15 amp.
- *b*) Cartridge type, renewable, 125 volt, 30 amp.
- *c*) Renewals for plug fuses
- *d*) Renewals for cartridge fuses

GROUND CLAMPS — ⅜ in. to 1 in., assorted
HICKEY GRIPS — ½ in. and ¾ in.
LAMPS
- *a*) Carbon, 220 volt, 60 watt
- *b*) Mazda, selected as wattages and voltages
- *c*) Guards for brass sockets

LEATHER NAIL HEADS
LUGS — 25 and 50 amp.
LUMBER — 2 by 4 in. by 14 ft., No. 1, white pine dressed, 4 sides
MOLDING
- *a*) Metal
- *b*) Metal, fittings — crosses, T's, internal elbows, junction boxes, switch bases, keyless receptacles, snap switches

NAILS — roofing
NUTS — iron, 4–36, 6–32, 8–32, 10–24, 12–24, 10–32, 14–20
OUTLET BOXES — 4 in. square, with one round blank cover, and one cover with bushed opening
PIPE STRAPS — galvanized, ⅜ in., ½ in., ¾ in., and 1 in.
PUSH BUTTONS
- *a*) Return call, 3 point
- *b*) Single

RECEPTACLES
- *a*) Flush, duplex
- *b*) Porcelain cleat, 660 watt, 250 volt
- *c*) Concealed
- *d*) Covers

RECTIFIERS — Tungar, for charging from 1 to 12, 6- and 12-volt batteries
RELAYS — Dixie
RESISTANCE BOARDS — for testing
RESISTANCE UNITS — 125-ohm
RHEOSTATS
- *a*) Compression, 275 watt
- *b*) Field, for shunt and compound motors

ROSETTES — wood
ROTARY CONVERTER — 5-kw. capacity, 3 phase a.c., 110 volt d.c.
SCREWS
- *a*) Anchors, 8/32, 10/24, 12/24, 14/20
- *b*) Machine, roundhead, 4–36 by ¼ in., 6–32 by ½ in., 6–32 by ¾ in., 8–32 by ¾ in., 8–32 by ½ in., 8–32 by 1 in., 10–32 by ¾ in., 10–24 by ⅜ in., 10–24 by ¾ in., 10–32 by ¾ in., 12–24 by 1 in.
- *c*) Machine, brass, roundhead, 4–36 by ¼ in., 6–32 by ½ in., 6–32 by ¾ in., 8–32 by ½ in.
- *d*) Wood, flathead bright, No. 5 by ¾ in., No. 8 by ½ in., No. 8 by ¾ in., No. 8 by 1 in., No. 7 by 1½ in., No. 8 by 1½ in., No. 7 by 2 in.
- *e*) Wood, roundhead blued, No. 7 by 1 in., No. 8 by 1½ in., No. 10 by 1½ in., No. 7 by 2 in.

SLEEVING — No. 1, white; No. 1, blue; and No. 1, red
SOCKETS
- *a*) Brushed, brass pull chain, keyless, key
- *b*) Porcelain, keyless, with caps
- *c*) Porcelain, key, with caps

SOCKET CAPS — ¼ in. and ⅜ in. bushed
SOLDER WIRE — 50/50, size No. 10
SOLDERING PASTE — 2 oz. cans, noncorrosive
SOLDERING SALTS — 1-oz. cans, noncorrosive
SPEED COUNTERS — 0–9999
SPLIT KNOBS — porcelain
SPRING BALANCES — 0–30 lb.
STARTING BOXES
- *a*) For compound motors, various makes
- *b*) For shunt wound, 1 h.p., 110-volt motors. Overload release
- *c*) For shunt wound, 1 h.p., 110-volt motors. No voltage release
- *d*) Starting devices of various makes and principles, for 1 h.p., 3-phase, 220-volt a.c. motors

STORAGE BATTERIES — 6 volt

(Continued on page 52A)

DESCRIPTIVE GEOMETRY

(Continued from page 46A)

they could not cut the stones to the correct size and shape they sought outside assistance and found that descriptive geometry principles could be applied to determine not only the true shape and size of the faces but the angle between them. The solution merely involved finding the angle between two planes as well as the true size of a plane. Either multiple auxiliary views or revolution can be used for such solutions.

Plumbing and piping work presents some good problems. Often *rule of thumb* and highly developed *cut and try* methods come close enough for most work. But in a situation where it is necessary to know the exact size of a long section of heavy 12-in. diameter pipe to be bolted between the flange faces of standard 45 deg., 60 deg., or some other type of fitting in a position making a different angle with both a horizontal floor and a vertical wall — then you can bring descriptive geometry to the rescue. This solution involves a *cone-locus of a line* principle which is not too difficult for a good vocational-trade drawing student to handle with the guidance of the instructor.

The law of belting sets forth that in order to run a flat belt onto a pulley the center line of the approaching belt must lie in the midplane of the pulley. In order to have a reversible system there must be a guide pulley which serves the purpose of delivering the belt onto the pulleys correctly. To find the exact location in the system where the guide pulley should be installed is a problem that can be handled nicely with *descript*. This brings us to the area of machine drawing. Another type of problem deals with the sine-bar principle as applied to revolving an oblique surface about mutually perpendicular hinges or axes to put the surface in a horizontal position for either grinding or milling. Then there are numerous occasions involving compound angles for cutters for machining grooves of various shapes.

In an over-all program in vocational-trade preparatory drafting there may be some place for some of the ideas that were suggested previously for use by industrial-arts drawing teachers. One thing is certain, once a drafting instructor exposes himself to a modern, thorough course in descriptive geometry he will have no difficulty in broadening his offerings to the pupils of his classes. The college descriptive geometry textbooks and problem workbooks that have appeared in recent years contain an abundance of practical type problems and situations.

The introduction to high school courses of items of the nature suggested in this article would not be amiss. At a summer school for college teachers of engineering drawing and descriptive geometry held at Washington University in St. Louis in 1946, one day was devoted to discussions by men from industry on the topic, "What Training in Graphics Does Industry Require of College Men?" The committee that summarized the papers and discussions noted that high on the list industry desired the college graduate to have a thorough grounding in the principles of descriptive geometry. Especially so for those men who would go into design work *on the board*. Considering how many industrial draftsmen get their first training in our technical high and trade schools it seems that whatever of these same principles we can teach to them will be valuable. Many high school graduates go *on the board* with the idea of making their lifework drafting. Few college graduates start out on the board with any definite plans to stay there long. Hence, it would seem that any upgrading of the training offered at the high school level, through introduction of some form of the subject matter of descriptive geometry, would be

(Continued on page 54A)

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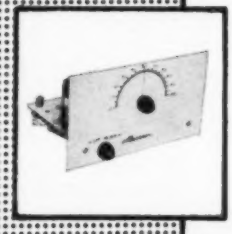

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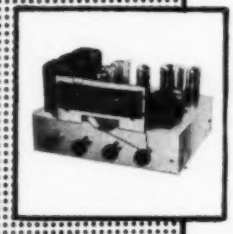

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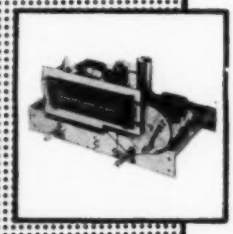

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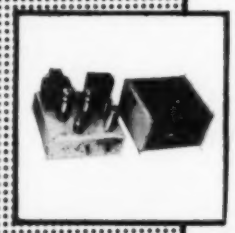

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Popular MEISSNER FM Receptor now in kit form. Converts AM receiver to static-free, high fidelity Frequency Modulation.

- Covers New FM Band 88 to 108 Mc
- 8 Tubes (including Rectifier) Supplied
- Top Quality Components
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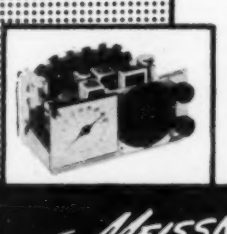
Model T8CK FM Receptor Kit, less wire & Solder, Net Price.....$29.97



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- Flat Within 2 db from 45 to 20,000 Cycles
- 20 Watts Output With 5% Harmonic Distortion
- Tubes: One 6SN7G9, Two 6L6G & One 5Y3GT
- All Parts Furnished Including Drilled-Punched Chassis
- 3 Volts RMS Input Required

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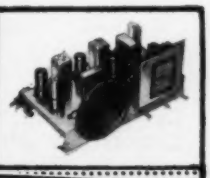
LONGTIME FAVORITES

BROADCAST BAND SUPERHET KIT

Easily constructed AC-DC Broadcast Superhet. 5 tubes including rectifier. Unusual performance and appearance. Ideal for class-room project, parts will withstand repeated rebuilding. Model T10-1191-A Superhet Kit with speaker & tubes, less wire & solder, Net $16.30

BC & SW BANDS SUPERHET KIT

50 to 1600 kc & 6 to 18 mc. Six tubes including rectifier. MEISSNER engineering assures ease of construction and top performance. 5" speaker for extended audio response. High stability. Has that "factory appearance." Model T10-1199, 2 Band Superhet Kit with speaker & tubes, less wire & solder, Net $21.75



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(Continued from page 50A)

SWITCH
- *a*) Battery, 4 point
- *b*) Bases, porcelain, for 10-amp. switches
- *c*) Boxes, 2¾ in. deep
- *d*) Entrance, safety, 2 pole, 30 amp., with 2-branch lighting circuits
- *e*) Entrance, safety, 3 pole, 30 amp., 250 volt
- *f*) Flush, push button, S.P., D.P., 3 way, 4 way
- *g*) Surface, S1, S3, and S4
- *h*) Knife, type A, D.P.S.T., D.P.D.T., S.P.S.T., and S.P.D.T.
- *j*) Surface, snap, electrolier
- *k*) Surface, snap, S.P.D.P., 3 way, 4 way

SWITCHBOARD — as required

TACKS — double-pointed No. 10

TAPE
- *a*) Friction, ½-lb. rolls
- *b*) Rubber, ½-lb. rolls

TELEGRAPH SETS — including sounders, keys, and relays

TELEPHONES
- *a*) Complete bridging, independent phones
- *b*) Couch vestibule telephones
- *c*) Receivers, transmitters, induction coils, condensers, and bridging switch hooks

TRANSFORMERS
- *a*) Bell ringing, 6, 8, 14 volt
- *b*) Single phase, 110–220 volt, S.K.V.A.

TUBES — porcelain, 5/16 by 3 in., 5/16 by 5 in., and 5/16 by 10 in.

TUBING — flexible nonmetallic, ¼ in. and ⅜ in.

WASHERS
- *a*) Iron, ¼ in. and ⅜ in.
- *b*) Brass, ¼ in. and ⅜ in.

WIRE
- *a*) Annunciator No. 18 or No. 20
- *b*) Fixture, No. 18, single yellow, with marker
- *c*) Rubber covered, solid copper, No. 10, black
- *d*) No. 10, white
- *e*) No. 14, black
- *f*) No. 14, white
- *g*) Rubber covered, No. 16, brewery cord
- *h*) No. 18, lamp cord, green and yellow
- *j*) S.C.C. copper magnet, enameled, sizes Nos. 16 to 26 inclusive

Electrical Shop — Motor and Testing Equip.

ANNUNCIATORS
- *a*) Automatic needle drop
- *b*) Gravity drop
- *c*) Manual needle drop

ARMATURES — burnt out, for repairing

BATTERY CHARGER — commercial

CIRCUIT BREAKERS
- *a*) Air, single pole, overload, 25 amp., 550 volt
- *b*) Air, single pole, underload, 15 amp., 550 volt

CONTROLLERS
- *a*) For multiple-speed motor
- *b*) For 1 h.p., 110-volt series motors

GENERATORS
- *a*) Motor-generator set, 10 h.p., to supply 110-volt d.c. for testing purposes, battery charging, etc.
- *b*) Generator, 6-volt d.c. coupled to an a.c. motor for 6-volt circuit testing
- *c*) Auto generators of different makes

GRAVITY CELLS

MAGNETS — testing, 10,000 ohm

METERS
- *a*) Ammeter, standard, 60 amp., a.c.
- *b*) Ammeter, standard, 60 amp., d.c.
- *c*) Ammeter, student, 60 amp., a.c.
- *d*) Ammeter, student, 60 amp., d.c.
- *e*) Voltmeter, standard, 0–10 volt,
- *f*) Voltmeter, standard, 110–220 volt, d.c.–a.c.
- *g*) Voltmeter, standard, 125 volt,
- *h*) Voltmeter, standard, 125 volt, d.c.
- *j*) Voltmeter, student, 110 volt, d.c.
- *k*) Voltmeter, student, 110 volt, a.c.
- *l*) Wattmeter, standard, 110–220 volt, 30–60 amp., d.c.–a.c.
- *m*) Wattmeter, student, 110–220 volt, 30 amp., a.c.–d.c.
- *n*) Watt-hour meter, 125 volt, 5 amp., a.c., single phase, various makes

MOTORS
- *a*) Auto starter, different makes
- *b*) Burnt out, fractional h.p., 110 volt, 60 cycle, for repairing
- *c*) Compound, 1 h.p., 110 volt, d.c.
- *d*) Multiple speed, 1 h.p., 3 phase, 220 volt
- *e*) Series, 1 h.p., 110 volt, d.c.
- *f*) Shunt, 1 h.p., 110 volt, d.c.
- *g*) Split phase and repulsive, a.c., 110 volt, single phase, assorted
- *h*) Split phase induction motors, fractional h.p., 110 volt, 60 cycle, different makes
- *j*) 3 phase, 1 h.p., a.c., 220 volt, various makes
- *k*) 3 phase, 2 h.p., 220 volt, a.c., various makes
- *l*) Universal, fractional h.p., 110 volt, different makes
- *m*) Universal, variable speed, ⅓ h.p.

PLATFORM SCALE — 100 lb. capacity

A New DURO Saw . . . *ideally suited for school shops*

new DESIGN!

new BUDGET PRICE!

The only 10" tilting arbor saw with all these features at this modest price!

D-3017 - New Duro 10" Ball Bearing Tilting Arbor Saw, complete as shown (less switch).

$167.50

Streamlined, ruggedly built for the toughest classroom operation. Ball bearing equipped . . . with *more new improvements* than any other saw in its price class!

INCREASED CAPACITY is a big *plus* feature of this new saw. Cast iron table is 32" x 25" with extensions . . . there is a full 10¼" ahead of the blade. You can make cuts up to 3¼" in thickness at 90°. Maximum distance from blade to fence is 15¾". Does dadoing up to 13/16" wide, with a 6" Duro dado set and throat insert.

MAXIMUM SAFETY is assured by newly designed rip fence which has a new "T" type safety guide bar . . . new cast blade guard which allows operator to see his work in safety . . . new lock-type switch prevents accidental operation of saw . . . as well as many more Duro safety features.

NEW SAFETY MOTOR MOUNT (illustrated) permits use of odd-size as well as standard motors. In addition, the motor is placed away from the sawdust stream . . . *any* standard open motor may be used. *COMPLETELY EQUIPPED*—price includes features and advantages ordinarily considered *extra* equipment. This saw is *complete*, with cast iron table extensions, 10" combination saw blade, safety blade guard, splitter anti-kickback, mitre gauge with cut-off rods and new, improved rip fence.

WRITE FOR FULL DETAILS and specifications on this new Duro "classroom-tested" 10" tilting arbor saw. Latest catalog describes the complete new 1950 economy line of precision engineered Duro Power Tools for home, school and industrial use. Write for your free copy *today*.

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DURO Authorized Dealer POWER TOOLS

Woodworking Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

BENCH
- *a*) Shop, with hardwood tops, 1¾ in. or over in thickness, the top to project far enough to allow a rapid-acting or continuous-screw vise to be attached.

  It may be well to order a 1-in. birch or maple board wide enough to cover the working face of the bench at the time of buying the benches. This board can then be fastened to the top proper with screws and may be conveniently replaced when worn. The benches should be made of thoroughly kiln-dried lumber throughout. They may be either plain or of 6-drawer type
- *b*) Glue
- *c*) Stain, with metal-covered top
- *d*) Teacher's demonstration

BLACKBOARD — permanent or portable

BOOKCASE

BULLETIN BOARD

CABINETS — wood or metal for filing class records, instruction sheets, drawings, finishing materials, hardware, small tools, supplies, etc.

CHAIRS — teacher's and tablet arm

CORE OVEN — for patternmaking class

DESK — teacher's, with drawer compartments

FURNACE — for melting soft metals (for patternmaking class)

GLUEPOT — 1 qt. or 2 qt., electric, gas, or steam heat

GLUE WARMER OR COOKER — 1- to 5-gal. capacity

GRINDER
- *a*) Automatic knife, direct-motor-type. Size to suit largest knife used in school shop, complete with water pump, grinding wheel, and automatic stops
- *b*) Bench, hand or power
- *c*) Bench, motor-in-head. Motor bearings to be completely housed, wheels to be equipped with safety flanges and carefully guarded throughout. One fine-grit, and one coarse-grit wheel
- *d*) Revolving oilstone, pedestal type, with one fine and one coarse oilstone

JOINTER
- *a*) 6-in. or 8-in. portable jointer. Table to be fitted for rabbetting. Safety-cylinder type, equipped with safety guard
- *b*) 12, 16, or 18 in. direct motor drive, ball bearing. Cylinder to be of safety-head type. Table to be fitted for rabbetting. Jointer to be equipped with safety guard

LATHES
- *a*) 6-in. to 16-in. motor-in-head, motor-in-base, or belt-driven speed lathe, to take 24, 36, 48, 60, or 72 in. between centers. Each to be complete with cup center, spur center, faceplate, rosette chuck, tool rests, and center drift for head block
- *b*) Patternmakers', with end faceplate provision. Lathe to be of direct-motor-drive type, equipped with variable-speed motor, faceplates and floor stand. (For patternmaking class)

MORTISER
- *a*) Direct-motor-drive, or belt-driven, hollow-chisel mortiser, foot feed. Table to be of the tilting type with hold-down clamps and stop rod
- *b*) Portable, vertical, hollow-chisel mortiser, bench type

PLANER — 12, 18, 20, 24, or 30-in., motor or belt-driven, single-surface planer. Safety-head cylinder, three-knife type, fitted with good-grade steel knives. Knife-setting and jointing device complete with bar should be mounted on machine if possible

SANDER
- *a*) Belt, direct motor drive
- *b*) Disk, motor or belt driven
- *c*) Oscillating spindle, motor driven
- *d*) Portable, hand-plane type, direct motor drive
- *e*) Vertical spindle and disk sander

SAWS
- *a*) Band saw, 20 to 36 in., motor drive. Upper and lower wheels to be completely guarded. Table to tilt to 45 deg.
- *b*) Combination, band saw, crosscut saw, ripsaw, and mortiser. Machine to be completely guarded
- *c*) Cutoff, pedestal or swing type to be fitted with 12-in. to 16-in. saw
- *d*) Filing machine, direct motor drive
- *e*) Jig, direct motor or belt driven
- *f*) Portable band saw, 14 to 20 in. ball bearing, motor driven
- *g*) Saw bench, directly connected to motor, and to have both rip and crosscut saws. Rip and crosscut gauges also to be provided
- *h*) Universal saw bench, 14 to 16 in., motor driven
- *j*) Variety saw bench, motor driven, tilting table, with universal sliding table. The arbor is to be fitted for a dado head, and the table is to be slotted accordingly. The saw is to be equipped with ripping fence and miter cutoff gauges

SHAPER
- *a*) Motor drive, single or double spindle. Table to be equipped with removable center plate
- *b*) Portable shaper or router with a suitable selection of cutters

TENONER — single end, with coping heads and cutoff saw

VISES — rapid-acting or solid-nut type woodworking-bench vises, 7 to 10 in.

WOOD TRIMMERS — complete with all gauges and taper pins. Base of trimmer to be slotted and laid out for degree settings (for patternmaking class)

Woodworking—Small Tools

AWLS — brad, assorted sizes

BEVELS
- *a*) Protractor
- *b*) Sliding T, 8 in.

BITS
- *a*) Auger, 3/16 in. to 1 in. inclusive, by 16ths
- *b*) Auger, 3/16 in. to ½ in. inclusive, by 16ths
- *c*) Braces, ratchet type, 8-, 10-, 12-, or 14-in. sweep
- *d*) Countersink, for wood, rose pattern, ½ in. and ⅝ in.
- *e*) Dowel, square shank, ¼ in., 5/16 in., ⅜ in., ½ in., ¾ in.
- *f*) Expansive, ⅞ in. to 1½ in.
- *g*) Expansive, ⅞ in. to 3 in.
- *h*) Forstner, square shank, ¼ in. to ½ in. inclusive, by 16ths
- *j*) Screw driver, square shank, ¼ in., 5/16 in., ⅜ in.
- *k*) Twist drill for wood, square shank, 1/16 in. to ⅜ in. inclusive, by 16ths
- *l*) Twist drill, straight shank, 1/16 in. to ⅜ in., inclusive, by 32nds

BLOWTORCH

BROOMS

BRUSHES
- *a*) Bench duster, 10 in.
- *b*) Floor
- *c*) Glue, round, 1½ in. and ¾ in.
- *d*) Glue, round, 1½ in.
- *e*) Marking, camel's hair, No. 1 and No. 2
- *f*) Varnish, flowing, 2 in. and 2½ in.
- *g*) Varnish, flat, ½ in., ¾ in., and 1 in.

BURNISHERS — oval or round

CAN OPENER

CARVING TOOLS
- *a*) Sets containing 6 tools
- *b*) Sets containing 12 tools

CHISELS
- *a*) Cold, machinists', ⅛ in. and ½ in.
- *b*) Mortising chisel and bits, ¼ in. to ⅝ in. by 16ths
- *c*) Socket firmer, bevel edge, ⅛ in., ¼ in., ½ in., ¾ in., 1 in., and 1½ in.
- *d*) Socket firmer, plain edge, ½ in., ¾ in., and 1 in.
- *e*) Tanged firmer, bevel edge, ⅛, ¼, ½, ¾, 1, and 1¼ in.

CLAMPS
- *a*) Bar, 24, 36, 48, and 60 in.
- *b*) Hand-screw, 4, 5, 6, 7, 8, 10, 12, and 14 in.

(Continued on page 56A)

DESCRIPTIVE GEOMETRY

(Continued from page 51A)

a worth-while contribution to the training of boys who will be going into industry.

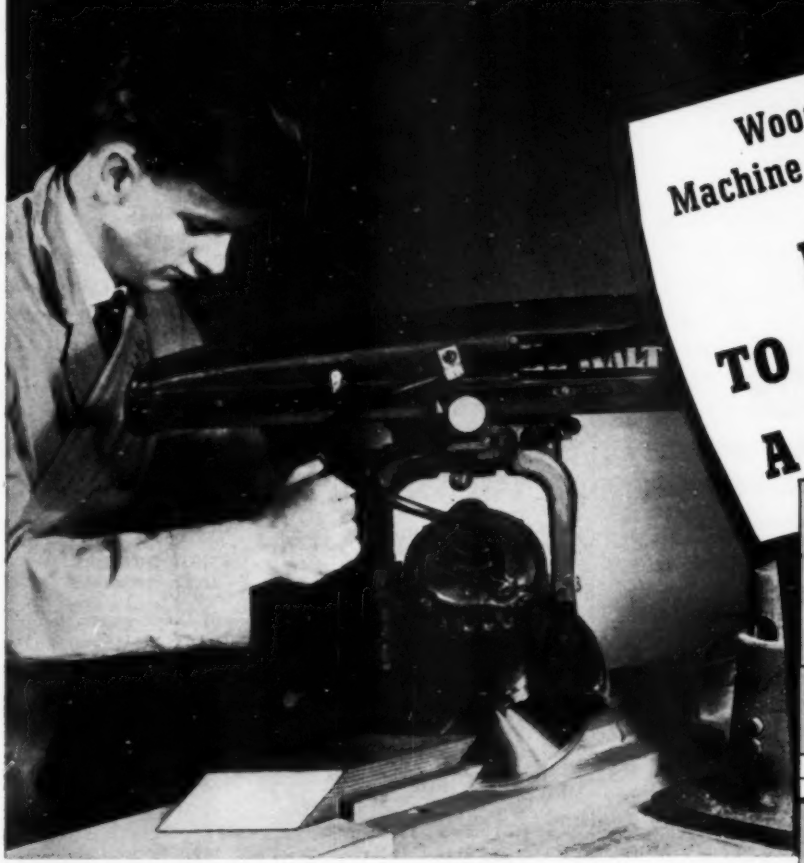
Systems of Descriptive Geometry

For those who would sometime enroll in a descriptive geometry course, a few words about the two types taught today may be in order. One of these is known as the Mongean system, taking its name from that of the Frenchman Gaspard Monge. Monge is credited with being the first man to arrange the problem of descriptive geometry into a system and with pointing out the fundamental principles involved. In 1768 he was made a professor at the military college at Mezieres, France, with the understanding that his descriptive geometry principles were to be a *military secret*. Shades of the atomic bomb! Claude Crozet, who was once a pupil under Monge, introduced descriptive geometry to this country in 1816 at the U. S. Military Academy at West Point. He wrote the first English textbook on the subject.

The Mongean or "indirect" or "projection" system makes use of all four of the space quadrants. It also uses the traces of planes in solving many problems. This feature becomes notably cumbersome with any but the simplest of examples. It also limits the practical value and application of the principles. There is little to recommend it in this day and age. This I know from firsthand experience after having been trained in the Mongean system while a university student and later finding out it was of very little use in industry. Probably less than ten leading universities still hang on to this method.

(Continued on page 61A)

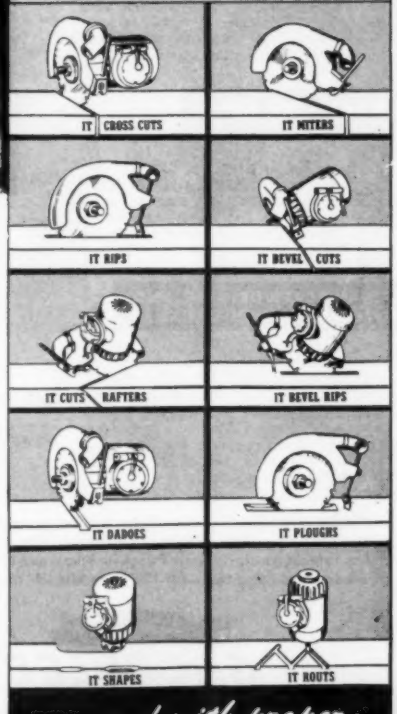
Make this a required course . . . and your wood-shop training is complete!



Wood Shop Machine Course No. 1

HOW TO OPERATE A DE WALT

DE WALT is a complete shop in itself



...and with proper tools makes any cut possible!

After the student has completed his basic training course in the use of hand tools, he should have a required course in the operation of DeWalt.

Knowing how to make the fullest use of this flexible, easy-to-operate machine, will give any student a head-start as he prepares for tomorrow's industry.

When he leaves school he will be fully acquainted with a machine that is destined to occupy a prominent place in tomorrow's industry. The perfection of the DeWalt saw has created new methods in cutting wood, making obsolete old-style equipment previously used.

Ask a nearby DeWalt dealer about two DeWalt 16MM movies—one showing the general application of DeWalt—the other showing modern, pre-cutting techniques developed during the war. Write for catalog.

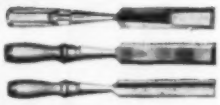
DE WALT, INC.

73 Fountain Avenue Lancaster, Penna.

Better shopwork with fine tools by GREENLEE

CHISELS, GOUGES, TURNING TOOLS

Tough, lasting fine cutting edges for all types of woodworking. Various types of socket butt and firmer chisels with "Hardwear" green plastic or hickory handles. Outside or inside bevel socket gouges. Short and full length turning tools.

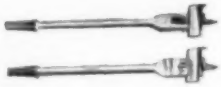


AUGER BITS, CAR BITS AND DRILLS

There's a GREENLEE for every need . . . all types of twists and heads. Accurately sized, perfect cutting edges. Line includes the famous "Greenlee 22" Solid-Center Auger Bits which come to you "Plastic Sealed" for factory-sharp edges.

EXPANSIVE BITS

Fast, easy-boring Expansive Bits with free, positive chip clearance. Specially-designed wide, open throat assures smooth, uninterrupted action. In two styles — Setfast with quick adjusting-locking feature and Plain.



SPIRAL SCREWDRIVERS AND AUTOMATIC PUSH DRILLS

GREENLEE Spiral Screw Drivers are sturdily constructed and have special phosphor bronze drive nuts for long, hard service. Beautifully finished, three sizes. Automatic Push Drills have completely enclosed working parts and phosphor bronze drive nuts. Handle holds eight points. Chromium plated.

The GREENLEE line also includes Bit Extensions, Razor-Blade Draw Knives, Ship Augers, Electricians' Bits, Hand Benders for Tubing, Radio Chassis Punches, Knockout Tools and many other timesaving tools for the shop worker and the student.

TOOLS FOR CRAFTSMEN
GREENLEE

Free Folder H-301 with complete data on GREENLEE hand tools for the woodworker. Write Greenlee Tool Co., Division of Greenlee Bros. & Co. 2023 Twelfth Street, Rockford, Illinois. U. S. A.

(Continued from page 54A)

c) Malleable-iron C, 4, 6, and 8 in.

DIVIDERS — wing, 6 in. and 10 in.

DOWEL PLATE — 6 in. long

DOWELING JIGS — with bushings

DRAWKNIVES — 7 in.

DRILL
- *a*) Automatic hand, with 8 drill points
- *b*) Chuck, 0 to 3/8 in.
- *c*) Hand, 0 to 3/8 in., for round-shank drills
- *d*) Star, for concrete, 1/2 in. and 3/4 in.

FILES
- *a*) Auger bit, assorted, 6 in.
- *b*) Cabinet, 8 in. and 10 in.
- *c*) Card and brush
- *d*) Flat, wood, 10 in.
- *e*) Mill, bastard cut, 12 in.
- *f*) Round, bastard cut, 12 in.
- *g*) Taper, slim, 5 1/2 in. and 7 in.

FIRST-AID CABINET AND SUPPLIES

GAUGES
- *a*) Bit, adjustable
- *b*) Jointer
- *c*) Marking, metal or hardwood
- *d*) Mortise, metal or hardwood
- *e*) Panel

GLASS CUTTER

GOUGES
- *a*) Tanged firmer, outside ground, handled, 1/8, 1/4, 1/2, 3/4, and 1 in.
- *b*) Tanged firmer, inside ground, handled, 1/8, 1/4, 1/2, 3/4, and 1 in.
- *c*) Spoon, 1/2, 3/4, and 1 in.

HAMMERS — claw, bell faced, 10, 12, 13, and 16-oz.

HATCHET — bench, 4-in. cut

JARS — earthenware, 1-qt. capacity

KNIVES
- *a*) Jointer, to fit power machine
- *b*) Planer, to fit power machine
- *c*) Sloyd, 3-in. blade

LEVELS
- *a*) Wood, 24 in.
- *b*) Machinists', 12 in.

MALLETS — hickory, 3 by 5 in. head

NAIL SETS — 1/16 in. and 3/32 in. points

OILERS — bench, 1/3 pt., coppered, best grade

OILSTONES
- *a*) 1 by 2 by 8 in. in iron box
- *b*) Gouge slip, medium, 4 1/2 by 2 1/4 by 5/8 by 5/16 in.
- *c*) Gouge slip, fine, 3 by 2 by 3/8 by 1/8 in.

PINCERS — 6 in. carpenters'

PINCH DOGS — 3/4, 1, and 1 1/4 in.

PLANES
- *a*) Block, adjustable, 6 in. long, 1 5/16-in. cutter
- *b*) Circular
- *c*) Combination, adjustable
- *d*) Core box
- *e*) Duplex, fillister and rabbet
- *f*) Fore, 1/4 in., 2 3/16-in. cutter
- *g*) Irons, double
- *h*) Jack, 14 in., 2-in. cutter
- *j*) Jointer, 24 in.
- *k*) Round, wood, 1 3/4 in.
- *l*) Router
- *m*) Smooth, 9 in., 1 3/4 in. or 2-in. cutter

PLIERS
- *a*) Roundnose, 5 in.
- *b*) Side-cutting, 6 in.

PUTTY KNIVES

RASPS — half round, wood, 10 in.

RULES
- *a*) Board
- *b*) 1 ft. or 2 ft. graduated by 8ths and 16ths
- *c*) Shrink, 1/8 in., 3/16 in.

SAWS
- *a*) Back, 12 in., 14 point
- *b*) Band, to fit power machine
- *c*) Compass, 10 in.
- *d*) Coping, frames
- *e*) Coping, blades
- *f*) Crosscut, 9 tooth, 22 in. long
- *g*) Crosscut, circular for power machine
- *h*) Dado, 1/8 in. to 1 1/16 in. to fit power-saw arbor
- *j*) Hack, frames, 10 in. or adjustable
- *k*) Hack, blades, 10 in.
- *l*) Keyhole, 10 in., 10 point
- *m*) Rip, 7 point, 22 in. long
- *n*) Rip, circular for power machine
- *o*) Set, 10 points per inch and finer
- *p*) Set, 10 points per inch and coarser
- *q*) Turning frame, 14 in.
- *r*) Turning blades, 3/16 by 12 in., 10 tooth
- *s*) Miter box, 24 by 4 in. saw, 7-in. capacity at miter

SCRAPERS
- *a*) Cabinet
- *b*) Glue, triangular
- *c*) Veneer, blade, 2 3/4 in. long, handle 11 in. long

SCREW DRIVERS
- *a*) Cabinetmakers', 4, 6, and 8 in.
- *b*) Quick return, spiral ratchet

SHOOT BOARD — and plane

SNIPS — tinners', forged steel, 2 1/2-in. cut

SPOKESHAVES — adjustable, raised handle, 10 in. long

SQUARES
- *a*) Combination, 12 in.
- *b*) Try-, iron handle, 8 in.
- *c*) Framing, 2 ft.

STEEL FIGURES — hand cut, 1/8 in.

TAPELINE — 50 ft., steel

TRAMMEL POINTS — adjustable metal frame, steel points

TURNING TOOLS
- *a*) Calipers, 6 in. inside and outside
- *b*) Calipers, 12 in. inside and outside
- *c*) Parting tools, 1/8 in.
- *d*) Round point, 1/4 in., 1/2 in., 3/4 in.
- *e*) Spear point, 1/4 in., 1/2 in., 3/4 in.
- *f*) Square point, 1/4 in., 1/2 in., 3/4 in.
- *g*) Turning chisels, 1/4 in., 1/2 in., 3/4 in.
- *h*) Turning gouges, 1/4 in., 1/2 in., 3/4 in.
- *j*) Turning skews, L.H., 1/4 in., 1/2 in., 3/4 in.
- *k*) Turning skews, R.H., 1/4 in., 1/2 in.

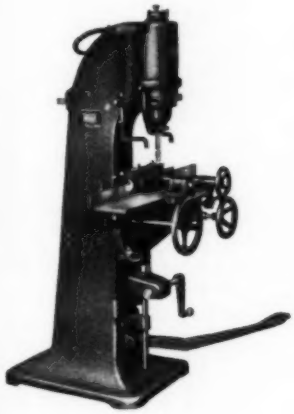
VISE — 3-in. jaw, anvil face

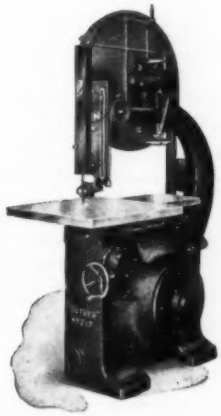
WRENCHES
- *a*) Adjustable, 8, 10, and 12 in.
- *b*) Headless setscrew
- *c*) Pipe, 10 in. and 12 in.
- *d*) S type or open-end type to fit 1/8-in. to 1-in. N.C. nuts

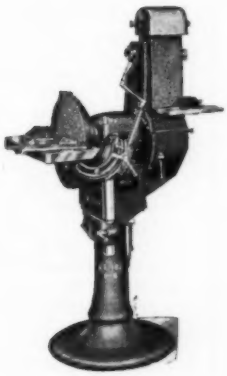
(Continued on page 58A)

"OLIVER" WOODWORKING MACHINERY

Give your students the best training on machines used in over 2200 vocational shops





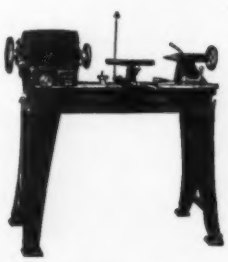


STUDENTS trained on "OLIVER" equipment have a decided advantage. They enter industry with a sound training as a basis for further progress, reflecting credit upon your instruction. Instructors in over 2200 vocational shops agree that "Oliver" machines do give more for the dollar in performance.

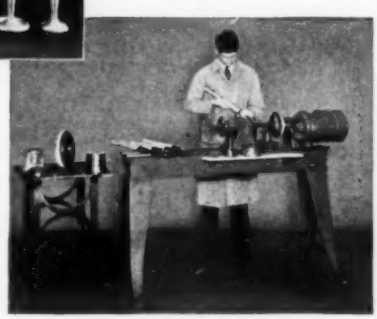
The ability to "take it" year after year without flinching characterizes "Oliver" machines. They are designed and built for industry by engineers who also know the needs for thorough student training. They have the latest safety features.

"Oliver" machines are easy to operate. Students soon learn to set up an "Oliver" accurately. Self-locking devices keep machines in perfect adjustment.

The machines shown here are but a few of a complete line to make your efforts most effective.



METAL SPINNING LATHE
— helpful and valuable in any shop!



You can spin beautiful as well as useful vases, cups, trays, etc., from pewter, copper, bronze and other sheet metals. The "Oliver" No. 159-M Metal Spinning Lathe is precision-built with extra heavy bearings to withstand severe service. Has ball bearing variable-speed motor-driven headstock and live tail center. Swings 12" diameter, 24" between centers. Lathe can also be used for turning wood and soft metals.

"OLIVER" EQUIPMENT FOR VOCATIONAL SHOPS

Circular Saw Benches	Surface Planers	Sanders
Swing Cut-off Saws	Boring Machines	Shapers
Metal Spinning Lathes	Mortisers	Tenoner
Wood Turning Lathes	Wood Trimmers	Oilstone Tool Grinder
Band Saws	Jointers	Knives and Saws
Band Saw Brazer	Jig Saw	Electric Glue Heater

Over 2200 vocational shops use "Oliver" equipment. If you'll tell use the machines that interest you, we'll send you illustrated bulletins containing full details.

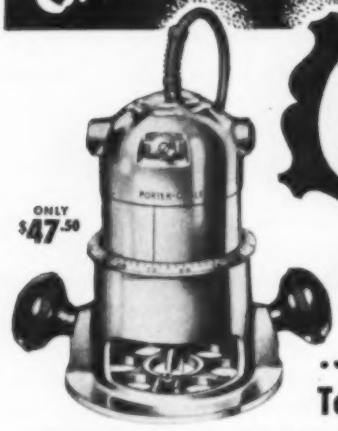
OLIVER

OLIVER MACHINERY COMPANY
Established 1880 **GRAND RAPIDS 2, MICHIGAN**

For Scores of

SHOP PROJECTS!

PORTER-CABLE Guild



ONLY $47.50

ROUTER

MODEL 100

...Most Up-to-Date Tool You Can Use!

● New on the market — and a sensation to boot — the Guild Router has broadened immensely the acceptance of the *light*, moderately priced router among professional as well as home-craft users. Makes all the cuts of a high priced router — yes, handles with amazing ease. Your students will enjoy using it — and so, by the way, will you.

Here are a few of the cuts you can make with a Guild Router

Makes ogee, cove, chamfer and other edge and corner cuts.

Does fluting, beading and makes other ornamental surface cuts.

Veins for inlay, makes relief and other fine, accurate cuts.

Makes decorative contours and many examples of intricate cutout work.

Grooves for weather-stripping—Dadoes for shelving — Rabbetts. Bits available for a wide variety of work.

INTERESTED IN SANDERS ?

Porter-Cable offers an unusually broad selection of Guild and Speedmatic Sanders. We particularly urge you to examine the Guild A-2 ($59.50) light belt sander — and the Speedmatic Sterling 1000 ($115.00), an orbital motion finishing sander.

Features Interchangeable Motor!

MAKE A POWER PLANE — in a jiffy, by attaching the Guild Router Motor to the Guild Portable Plane attachment. It's also a cinch to make a Jointer from the Plane — by simply attaching the Plane to a Guild Bench Stand. This interchangeable motor is in line with today's trend towards *economical* adaptable tools. Keep your shop class in tune.

Porter-Cable Machine Co.

2663 N. Salina St., Syracuse 8, N. Y.

Please send me full information about ☐ the Guild Router, ☐ Guild Power Plane, ☐ Guild Jointer, ☐ Guild A-2 Sander, ☐ Speedmatic Sterling 1000 Sander. Also name of nearest dealer.

Name.....

School.....

Address.....

City.....Zone.....State.....

In Canada (except B. C.) write to: Strongridge, Ltd., St. Catharines, Ont.

(Continued from page 56A)

Woodworking— Materials and Supplies

ALCOHOL

BENZINE

BRADS — 3/8 in., 1/2 in., and 5/8 in. No. 20; 3/4 in. and 7/8 in. No. 19; 1 in. No. 18; 1 1/4 in. and 1 1/2 in. No. 16; 1 3/4 in. No. 15; 2 in. and 2 1/2 in. No. 14

CARBON PAPER — black

COLORS — dry: burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, Vandyke brown, and vermilion

COLORS — ground, in oil or japan: burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, rose lake, Vandyke brown, and vermilion

DECALCOMANIA TRANSFERS

DOWEL PINS AND PLATES

DOWELS: hardwood, 3-ft. lengths, 1/4 in., 5/16 in., 3/8 in., 1/2 in., 3/4 in.

ENAMEL
- a) Selected colors
- b) Undercoater

FILLERS — paste: natural, golden oak, dark oak, and mahogany

FILLETS — leather, 1/4 in. and 1/2 in.

GLUE
- a) Casein, hide, best grade cabinet
- b) Liquid

HARDWARE: Brackets, buttons, butts, casters, catches, chain, chest corners, chest trimmings, corner braces, corner irons, corner plates, desk fittings, door fittings, escutcheons, fasteners, handles, hangers, hinges, hasps, holders, hooks, knobs, latches, lamp fittings, lid supports, locks, pulls, smoking-stand outfits, springs, stops, supports

HOOKS
- a) And eyes
- b) Cup
- c) Screw and
- d) Square screw

LACQUER — black, clear, cobalt blue, ivory, medium green, red, thinner, white, and yellow

LUMBER — Ash, balsa, bass, birch, cherry, cypress, locust, mahogany, maple, oak, poplar, red cedar, red gum, redwood, sap gum, yellow pine, walnut, white pine

In ordering pine, mill run, kiln dried will be found suitable for carpentry, while short, select, kiln dried, 4 in. and wider or No. 1 shop common, kiln dried will be required for cabinetmaking and patternmaking

Hardwood, for furniture, should be specified first and second grade, kiln dried, standard widths and lengths, or short lengths

MOLDINGS

NAILS
- a) Common, 6d, 8d, and 10d
- b) Flathead, 1/2 in. No. 20, 3/4 in. No. 19, 1 in. No. 18, 1 1/4 in. and 1 1/2 in. No. 16, and 2 in. No. 14
- c) Finishing, 4d, 6d, and 8d

OIL
- a) Linseed, boiled
- b) Linseed, raw
- c) Machine
- d) Rubbing

OVERLAY CARVINGS

PANEL OR PLYWOOD — 3 ply, 5 ply, and 7 ply

PATTERN LETTERS

PINS — escutcheon

PUMICE STONE — No. 0

RAPPING PLATES

ROTTENSTONE

SANDPAPER — Garnet cabinet paper, 3/0, 2/0, 0, 1/2, 1

Garnet finishing paper, 6/0, 4/0

Garnet paper can also be obtained in rolls of 50 yd. in widths 4 in. up to 48 in. Narrower widths on special order

SCREW EYES

SCREWS
- a) Flathead, brass, No. 3 by 3/8 in., No. 4 by 1/2 in., No. 5 by 5/8 in., No. 5 by 3/4 in., No. 6 by 3/4 in., No. 7 by 3/4 in., No. 8 by 1 in., No. 10 by 1 1/4 in., No. 10 by 1 1/2 in., No. 12 by 1 1/4 in., No. 12 by 1 3/4 in., No. 10 by 2 in.
- b) Flathead, bright, No. 3 by 1/2 in., No. 4 by 1/2 in., No. 6 by 3/4 in., No. 7 by 7/8 in., No. 8 by 1 in., No. 10 by 1 in., No. 8 by 1 1/4 in., No. 10 by 1 1/4 in., No. 14 by 1 1/4 in., No. 10 by 1 1/2 in., No. 12 by 1 1/2 in., No. 10 by 1 3/4 in., No. 12 by 1 3/4 in., No. 10 by 2 in., No. 12 by 2 in., No. 14 by 2 in., No. 12 by 2 1/4 in., No. 14 by 2 1/4 in., No. 14 by 2 1/2 in.
- c) Oval head, brass, No. 5 by 3/4 in., No. 6 by 3/4 in., No. 7 by 7/8 in., No. 8 by 1 in., and No. 10 by 1 1/4 in.
- d) Roundhead, blued, No. 3 by 3/8 in., No. 3 by 1/2 in., No. 5 by 3/4 in., No. 6 by 3/4 in., No. 7 by 7/8 in., No. 8 by 1 in., No. 10 by 1 1/4 in., No. 10 by 1 1/2 in., No. 12 by 1 1/2 in.
- e) Roundhead, brass, No. 3 by 3/8 in., No. 4 by 1/2 in., No. 4 by 5/8 in., No. 5 by 3/4 in.

SHELLAC
- a) Orange, cut 4 lb. to the gal.
- b) Sticks, assorted colors
- c) White, cut 4 lb. to the gal.

NOTE: Shellac should be kept in glass or earthenware containers

STAINS — oil, spirit or water. Fumed oak, dark oak, golden oak, light oak, mahogany, and walnut

STEEL WOOL — No. 0 and No. 2/0

TURPENTINE

TWINE

VARNISH — coach, flat, remover, spar, and rubbing

WASTE — cotton, white

WAX — bees and finishing

WHITE LEAD

WALLACE *woodworking* WONDERS

for your shop this year

(Above)
WALLACE NO. 11 —
UNIVERSAL SAW

With tilting arbor — cuts are made at any angle. Motor and spindle ball-bearing equipped. Fast, smooth, safe cutting. Gear-driven; motors up to 3-H.P. Economical, accurate!

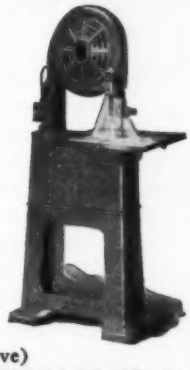
WALLACE

(Below)
WALLACE NO. 10 —
8" JOINTER

20,800 bites per minute with geared motor drive. All-steel cutter-head with four adjustable skew-set knives. No other Jointer equals its faster, smoother performance!

BETTER CRAFTSMANSHIP INCREASING ECONOMIES PERFECT SATISFACTION

WALLACE wood-working machines are truly "wonder-working" machines. Because they turn out such wonderful work! When you INSTALL them — and actually USE them — you will always wonder why you got along without them. They are, indeed, the very ACME of Quality, Strength, and Performance!



(Above)
WALLACE NO. 16 —
16" BAND SAW

New high speed, 1100 r.p.m. gives a blade speed of 4600 lineal feet per minute. Smoother, faster production. Gear drive permits optional speeds. Other distinctive features. Strongly built — to last!

(Above)
WALLACE NO. 9 —
MORTISER

All moving parts exactly centered with slide rods insuring accurate and effortless operation. Motor has patented non-leaking bearings; keeps out oil and dust. Bit capacity up to 1" square.

Let us show you why WALLACE MACHINES are built better; why they do better work; and liquidate their installation costs, often in a short time. It always pays to buy the best.

(Above)
WALLACE NO. 28 —
HY-GEAR SHAPER

Geared up to a spindle speed of 10,000 r.p.m., this Shaper produces smoother, faster, superior work. Right and left rotation facilitates set-up; eliminates sanding.

WALLACE

(Below)
WALLACE NO. 46 —
MULTI-SPEED LATHE

Built on a new principle. Headstock swivels, large face-plate turning done in front of lathe. 9-speeds, uniformly graded, 550 to 2400 r.p.m. Umlimited capacity and versatility!

Prompt Deliveries on All Orders

. . . . . WRITE TODAY FOR FREE BULLETINS AND PRICES . . . . . .

J. D. WALLACE & COMPANY

140 So. California Avenue . . . . Chicago 12, Ill.

"TEACH THE BOYS TODAY

WITH THE GLUE THEY'LL USE IN THEIR WORK TOMORROW"

Saves You Trouble
Saves You Time
Improves Work

1. Mixes quickly and easily with cold tap water.
2. Spreads smoothly and easily.
3. Sets fast! Joints can be light-worked within a few hours.
4. Tremendous strength... joints are stronger than the wood itself.
5. Stain-free and resistant to water.
6. Bacteria- and rot-proof.

Weldwood Glue is available in a variety of sizes at your school supply house, hardware store or lumber yard. Mail coupon for full information and sample.

WELDWOOD PLASTIC RESIN GLUE

UNITED STATES PLYWOOD CORPORATION
Industrial Adhesives Division, Dept. 610,
55 West 44th St., New York 18, N.Y.
Please send me literature and free sample of Weldwood Glue.

Name_____ Position_____
School_____
Address_____
My regular supplier is_____

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Use CASCO Project Service to provide new ideas. Send coupon for two books which have proved most valuable to instructors all over the country—32-page book illustrating 94 Easi-Bild* Patterns . . . 96-page "How to Make Veneer Panels"

PUT THE RIGHT GLUES

at your students' elbows

There is a CASCO glue for every project. Waterproof CASCOPHEN (Resorcin Resin), the only completely boilproof glue in consumer sizes. Highly water-resistant, stainfree CASCAMITE (Urea Resin)—for veneering and fine cabinets. Strong, water-resistant CASCO (Casein), standard cold-water glue for interior work, many materials. Fast-setting, ready-to-use CASCOREZ (Polyvinyl Resin) for model building, etc.

Send coupon, addressing

THE BORDEN COMPANY Chemical Division

Makers of CASCO Glues

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THE BORDEN COMPANY, Chemical Division, Dept. IA-30
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Please send me items checked
☐ Book of 94 Easi-Bild patterns . . . . . 20¢
☐ "How to Make Veneer Panels" . . . . . 75¢
☐ FREE CASCO gluing chart and glue folders —
Enclosed is . . . . . Total $

Name_____ Title_____
School_____
City_____ Zone_____ State_____

DESCRIPTIVE GEOMETRY

(Continued from page 54A)

The second method is known as the *direct method*. Anyone who studied descriptive geometry many years ago under the Mongean system will recall their struggles with a difficult and uninteresting subject. Because it had little transfer to practical situations its training value was minimized. Then several leaders in the field of drawing and descriptive geometry developed a procedure which omitted all the impedimenta of the Mongean method but retained the fundamental principles and set them forth in a system closely related to commercial practice. The use which now can be made of the material has given both the student and industry a new faith and interest in the subject. This was evidenced during the recent war when engineers and draftsmen who had once studied the subject found it worth while to enroll in evening classes for refresher courses along with those who never had taken such a course. For one to get the most out of descriptive geometry so that he may apply the material to his own teaching, he should study the *direct method* system.

Summary

It has been the purpose of this discussion:

1. To point out the fact that many teachers of mechanical drawing have never had a formal course in that subject in which can be found all the basic principles of projection drawing. And further, that to take such a course even now would be a mark of academic as well as professional achievement.

2. To point out a few instances in which some of the subject matter of descriptive geometry could be of use in drawing courses below the college level.

3. To acquaint you briefly with the two schools of thought, or systems, or methods of approach to the subject. And in the light of personal experience working with classes at all levels from seventh grade through college and beyond into industry, to suggest for you the method of instruction under which you probably would get the most out of a descriptive geometry course.

THE 10-INCH SAW TABLE WITH EXTRA CAPACITY AND PRECISION BUILT IN

You can square off work up to 13-inches wide in front of the blade with a Boice-Crane without costly additional front extensions, necessary with other saws and which still leaves you with a light weight, inaccurate machine.

Precision is MACHINED into every part of a Boice-Crane. It not only looks substantial but IS substantial. Such important parts as the ripping gauge aren't stamped out, pressed out or die cast but MACHINED FOR PRECISION.

The Boice-Crane is the only 10" Tilting-Arbor Saw

which can be driven by low-cost standard motors, gas engine or line shaft by using rolling drive pulley.

The largest arbor (¾") and heaviest bearings of any 10" saw. Handles heavy overload.

Motor is entirely separate from machine and away from dust, keeping vibration from the arbor, eliminating needless wear on trunnions and slide ways. Stays accurately locked in any tilted position.

28" long cast iron rip fence, precision ground both sides. Features one-knob lightning-fast automatic control of both front and rear locks. Fence is aligned as it micro-sets, saving the necessity of reaching over blade to set or adjust fence. Secure and accurate alignment on first lock-up.

Conveniently grouped controls for quickly, accurately tilting, raising and lowering saw blade. Positive locks. Easy-to-read accurate gauges. Large dust chute encloses lower portion of blade and discharges sawdust away from motor.

Finest miter-gauge yet designed, with patented plunger-setting and adjustable stops for 45° and 90°.

Extra large trunnions for super-accurate saw blade alignment. Approved safety guard hood shields entire saw-blade, tilts with blade. Ribbed steel splitter, prevents work binding. Anti-kickback feature.

Powerful V-belt drive capable of transmitting up to TWO horsepower. Available in bench or floor models.

SPECIFICATIONS

Table: 20" x 27". Saw Blades: 10" dia. max. — Dado Heads 6" dia. x 1-1/16" wide. Depth of cut: Saw Vertical: 3"; Saw Tilted: 2⅛". Cut-off Capacity: 13" clear before blade.

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☐ TILTING-ARBOR SAW
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Boice-Crane intermediate capacity power tools are of just the right size for most of your jobs — they're not too big, nor too small.

INDUSTRIAL WORKER'S LIFE AVERAGES 65 YEARS

DR. WALDEMAR SCHWEISHEIMER
Lowell, Mass.

In the fabulous good olden times — as the story goes — men were better, healthier, and lived longer. It is easy to say those things, though it would be hard to prove them. To give an example: it is difficult to prove or to refute the thesis that Methuselah reached an age of almost 1000 years; or Noah 600 years; or Moses only 120 years.

As soon as we are able to examine such statements thoroughly, the view changes. Statistical figures give evidence that the average human life is longer today than at any time in history, and further extension of life may be expected in the future. The United States give a clear picture of this development for several reasons: there are reliable American health statistics, the country has not been ravaged by war damages like a good many European countries, and the average figures are drawn from the large number of 130 million inhabitants.

Length of Life at Record High

Recently published figures show the length of life at the record high of 64.95 years in the industrial population. For many decades the length of life of industrial workers was below the average of the total population. It seems that both working conditions and general standard of living had been worse among industrial workers, and though their life became

(Continued on next page)

FIVE NEW BOOKS TO CROW ABOUT!

Second Edition

MACHINE SHOP THEORY AND PRACTICE

Wagener and Arthur. The new edition incorporates all new designs of basic tool machines. New pictures, diagrams, and exercises in reading precision measuring tools. New shop safety material. Officially adopted for Ford Motor Company.

Second Edition

WORKBOOK FOR ABOVE

In the new edition, all essay type questions have been replaced by multiple choice, completion, matching, etc. Completely revised and reset.

Third Edition

TELEVISION SIMPLIFIED

Kiver. Includes all latest developments on this fast-moving field. New chapters on color television and Intercarrier sound system. This is the book that radio schools use as a basic text.

Second Edition

TELEVISION AND F-M RECEIVER SERVICING

Kiver. New edition covers fully all the new circuits and their peculiar problems. New chapters on Intercarrier sound television and the use of test patterns. Thoroughly revised.

A.C. WINDINGS

Liwschitz-Garik. Diagrams and tables which enable a technician to proceed without further help in the various types of AC windings. Over 100 drawings by National Coil Company.

Van Nostrand

250 FOURTH AVENUE, NEW YORK 3

INDUSTRIAL WORKER'S LIFE SPAN

(Continued from previous page)

longer as well, it did not reach the life extension of the average total population for a long time.

This has changed, however. The two lines which represent the average life of the total population and that of the industrial population, grew closer and closer together through the years, and today they are on the same level. Here are some new facts and figures which were recently published by the Metropolitan Life Insurance Company. The expectation of life at birth reached an all-time high of 64.95 years among the millions of industrial policyholders of the company. Excluded from this survey were deaths from enemy action. Comparisons with earlier years give astounding gains — almost 4¾ years in the past ten years, nearly 9½ years in the past twenty years, and more than 18 years in the past third of a century.

This good record for the war years was achieved despite many adverse conditions. The very large number of insured men called to the colors were exposed to the special risks of military life — particularly accidents (enemy action was excluded from the survey, as mentioned before). The civilian population suffered hardships and

(Continued on page 69A)

Association News

THE A.V.A. CONVENTION

(Continued from page 19A of the February, 1950, issue)

National Association of Teacher Trainers

The program chairman of this group was Edward Berman, assistant superintendent of schools, Bayonne, N. J.

G. Harold Silvius, Wayne University, Detroit, Mich., was chairman of the Monday morning session, at which Gordon O. Wilber, Oswego, N. Y., reported on his five-thousand-mile trip on which he visited many teacher training colleges.

C. Kenneth Beach, Ithaca, N. Y., reported on the 1949–50 activities of the industrial education research committee.

Homer J. Smith, Minneapolis, Minn., led in a thought-provoking discussion, which deserved the title "For the Good of the Order."

C. Kenneth Beach was chairman of the Monday afternoon meeting. A. D. Althouse, Detroit, Mich., spoke at this session on "Training Automobile Mechanics Instructors."

Arthur P. Twogood, Ames, Iowa, and M. L. Barlow, Los Angeles, Calif., made reports on visual aids in industrial teacher training and for industrial instructors.

On Tuesday morning a joint meeting was held with the state supervisors. At this meeting Robert M. Reese, Columbus, Ohio, acted as chairman.

J. R. Dalzell, American Technical Society, Chicago, Ill., spoke on "Development and Publication of Text Materials," and Arthur B. Wrigley, Trenton, N. J., and Edward Claude, Springfield, Ill., reported on various phases of instructional material.

DeWitt Hunt, Stillwater, Okla., was the chairman at the Tuesday afternoon session at which H. D. Bearden, College Station, Tex., presented his views on what the "Teacher Training Plan for a Large State" should be.

B. A. Turner, Houston, Tex., reported on the activities of the Committee on Occupational Opportunities in Industrial Education; and H. H. London, Columbia, Mo., did likewise for the Committee on Trade Competency Examinations.

The National Association of Industrial Teacher Trainers held their annual business meeting at a luncheon on Friday, December 9, at 12:30 p.m.

National Association of Trade Supervisors of Trade and Industrial Education

Robert M. Reese was chairman of the meeting on Monday afternoon, December 5, 1949.

The subjects discussed were "The Junior College Movement and Its Implications to Trade and Industrial Education," "An Experiment in Training Trade Teachers," and "Results of the Further Study of the Diversified Occupations Program," and the speakers were J. Graham Sullivan, Contra Costa Junior College District, Calif., Arthur J. Elges, Detroit, Mich., and J. F. Ingram, Montgomery, Ala.

Industrial Education Section

In the Wednesday morning meeting, "Vocational Education in the Immediate Future" was discussed by R. W. Gregory, Washington, D. C., Blanche M. Penn, Worcester, Mass., William F. Patterson, Washington, D. C., Galen Jones, Washington, D. C., James L. McDevitt, G. H. Metz, Camden, N. J., and A. D. Althouse.

The chairman of this meeting was John A. McCarthy, assistant state commissioner of education, Trenton, N. J.

On Wednesday afternoon, other questions discussed were "Organization for Vocational Education," "Home Economics Education and Industrial Education for Women Co-operate for Improved Family Living," "Planning Vocational School Buildings, Shops and Laboratories," "The Education of the 60 Per Cent — A Life Adjustment Program of Education," and "Vocational Education for Out-of-School Youth."

The subjects reserved for study on Thursday were "The Place and Function of Private Trade Schools in a Complete Program of Vocational Education," "Training Within Industry," "Training Commercial Photographers," "Vocational Education Through the Co-operative Part-Time Diversified Occupations Program," "Practical Nurse Education," and "Developing New Educational Opportunities for Girls and Women."

The program for Friday for the industrial education section embraced the following subjects: "Vocational Education Trains for the Garment Industry," "Apprenticeship and Apprentice Training," "Trade Preparatory Training for the Industrial Chemistry Field," "Recent Developments in Veterans Training," "Teaching Pupils of All Abilities," "Girls and Women in Industry," "Supervisory Training," and "Automobile Mechanics — General Meeting."

On Saturday morning separate sessions were held on the following themes: "Visual Aids in Vocational Education," "Hotel and Restaurant Training," "Public Vocational and Secondary Schools," "Key Problems of Graphic Arts Education," "Testing in Vocational Education," and "Improving Instruction in Treatment of Metals."

Sectional meetings also were held on the subjects of vocational guidance, and vocational rehabilitation.

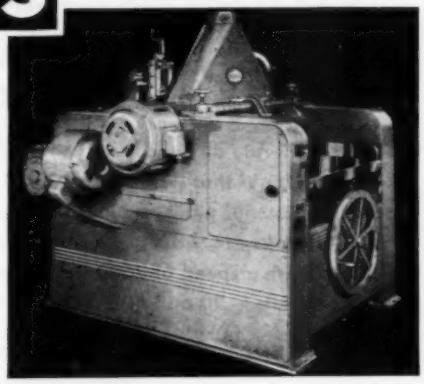
The House of Delegates met on Friday afternoon. The following officers were elected: Frank C. Moore, director of industrial arts education, Cleveland Public Schools, Cleveland, Ohio, president. The term is for one year.

Mr. Moore was named by members of the House of Delegates, legislative body of the A.V.A., to succeed E. L. Williams, director of the industrial extension service, Texas A. and M. College, College Station, Tex., who becomes past president and director of the Vocational Guidance Section.

(Continued on page 64A)

BUSS

No. 4L



THE IDEAL MACHINE FOR TEACHING WOOD PLANING PRACTICE!

A real production machine universally used in woodworking establishments, yet priced way below the larger machines. Equipped with wedge adjusted bed and the same highly developed control features used on our largest production planers. Safest planer built. Has sectional infeed roll, "no-kick-back" sectional chipbreaker and all moving parts are fully enclosed. It's the ideal machine for teaching STANDARD wood planing practice. Write for Bulletin No. 54 for complete details.

BUSS MACHINE WORKS

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Shop Benches

BY SJÖSTRÖM

PROMPT DELIVERY

Sturdy Sjöström Work Benches—

- Ideal for school shops where long life and maximum utility are a "must".
- Attractive heavy duty construction—natural finish maple and birch, with stout 2¼" edge grain tops; tops and bases bolt reinforced.
- Four types—single (52" x 22" x 32") and two student (52" x 36" x 32") types; with or without tool drawers of durable dovetailed construction.
- Equipment for each student—continuous screw vise with ample 4" x 7" jaws, metal bench hook and dog.

Write Today for Prices and Specifications.

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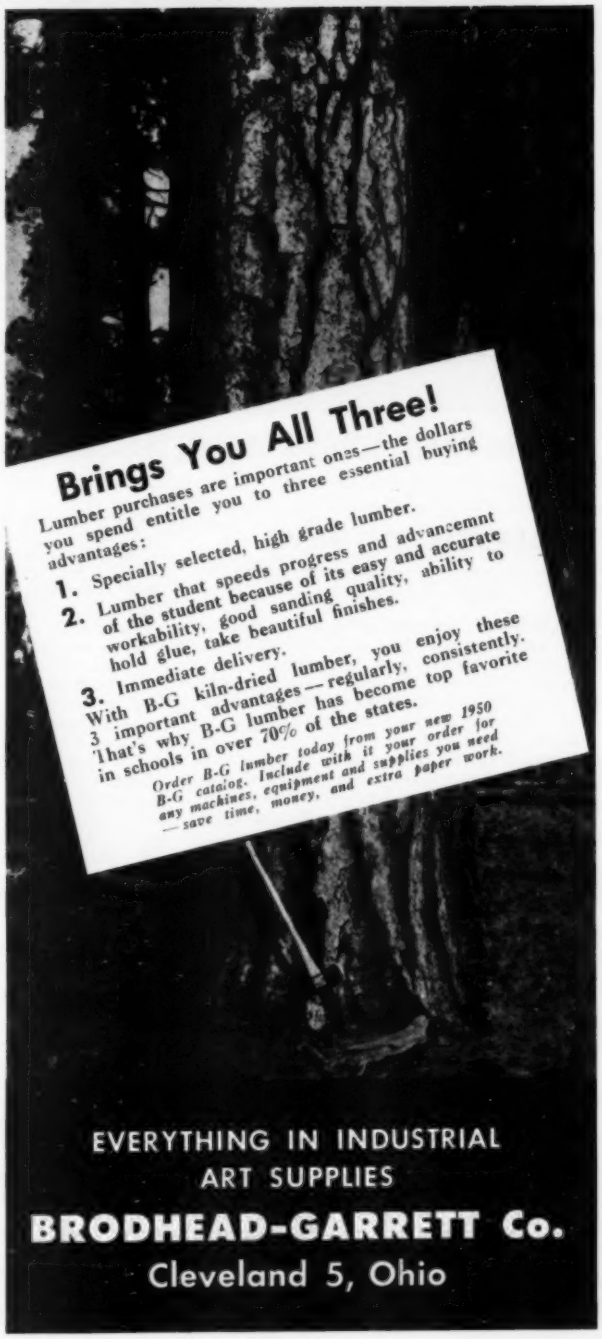
"SOFT TEXTURE" LUMBER



Brings You All Three!

Lumber purchases are important ones—the dollars you spend entitle you to three essential buying advantages:

1. Specially selected, high grade lumber.
2. Lumber that speeds progress and advancemnt of the student because of its easy and accurate workability, good sanding quality, ability to hold glue, take beautiful finishes.
3. Immediate delivery.

With B-G kiln-dried lumber, you enjoy these 3 important advantages—regularly, consistently. That's why B-G lumber has become top favorite in schools in over 70% of the states.

Order B-G lumber today from your new 1950 B-G catalog. Include with it your order for any machines, equipment and supplies you need —save time, money, and extra paper work.

EVERYTHING IN INDUSTRIAL ART SUPPLIES

BRODHEAD-GARRETT Co.

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PARKS No. 20 20" PLANER

Here is a modernly designed, rugged, high-speed, low-priced planer that is ideally suited for every shop and industrial plant requiring a quality surfacer. The Parks No. 20 Planer has a four-knife cutterhead with a speed of 3600 R.P.M. and offers two feed speeds — 20 and 40 F.P.M., and 40 and 80 F.P.M. Write for complete descriptive literature.

The PARKS Heavy-Duty 12" x 4" Planer

A compact, sturdy, thickness planer that offers mill planer precision and ruggedness at a sensationally low price. Write for descriptive catalog sheet.

The PARKS WOODWORKING MACHINE CO., Dept. 22-MM, 1546 Knowlton St., Cincinnati 23, O.

ASSOCIATION NEWS

(Continued from page 62A)

Dr. Charles W. Sylvester, assistant superintendent for vocational education, Baltimore, Md., was re-elected to a one-year term as treasurer.

Vice-presidents elected for three-year terms were: industrial education, J. C. Woodin, director of industrial and adult education, Board of Education, Wichita, Kans.; and industrial arts education, Roy G. Fales, state supervisor of industrial education, Albany, N. Y. Elected vice-president for one year was: home economics education, Mrs. Eva W. Scully, state supervisor of homemaking education, Phoenix, Ariz.

The terms of other AVA vice-presidents do not expire this year. L. H. Dennis, of Washington, D. C., continues as executive secretary.

The delegates voted to hold their 1950 convention in Miami, Fla., during the week of November 27; and their 1951 meeting in Minneapolis, Minn., provided necessary arrangements can be made in these cities.

The election of Frank C. Moore as president of the American Vocational Association is a fine recognition of the excellent work done by the industrial-arts section of the A.V.A.

The Ship's program was held on Friday, December 9, at 8 p.m.

Chester Messmore, International Textbook Co., Scranton, Pa., held the position of captain. He introduced R. H. Simpson, vice-president and treasurer of the Chas. A. Bennett Co., Peoria, Ill., as chairman of the Citation Committee. The man chosen for the honor of receiving the annual citation was Tom Diamond. Mr. Simpson's speech and the citation follow:

"This evening we are citing the Head of the Vocational Education Department of a great State University, who has had a long and distinguished career in the training of teachers for trade and industrial education.

"He gained his early education in his native Scotland where he learned the patternmaker's trade and completed a course at the Coatbridge Technical School.

"Looking westward for greater opportunities, he came to the United States in his early youth and became a journeyman patternmaker at the Allis-Chalmers Company in Milwaukee. Before long his talent for leadership was recognized, and he was made a foreman. However, at heart he was always a teacher.

"This quality became apparent to leaders in education in Milwaukee and he was invited to become a member of the staff of the Boys' Technical High School of that city where he served for several years. While teaching in Milwaukee, this youthful Scotsman felt the need for more formal education so he began taking courses at the University of Wisconsin. There again his capacity for leadership and his scholarship were quickly recognized and he soon became an instructor at that University. In 1919 he became a member of the staff of the School of Education at the University of Michigan where he has served ever since.

"Practically every school in his adopted state has benefited from his counsel and guidance through the past 30 years.

"But his influence has not been confined alone to the fair state of Michigan. He has served many national organizations as speaker on professional programs, as a writer of meaningful articles, and as an editor of professional periodicals. He has served the War Production Board, the War Manpower Commission, the War Department, and also various labor unions in consultive positions. He has been a valuable and much appreciated member of the American Vocational Association and has served generously on numerous committee and publication assignments. He belongs to many professional organizations and fraternities in his chosen field, and in several of them he has been an officer.

"It is not only the University and state which have profited from his wide experience and unusual insight. Students from his classes have gone out to positions of importance throughout the United States and the world.

"So it is with great pleasure that I present, on behalf of the Ship, an engraved gold wrist watch and band, and Distinguished Service Citation, to this renowned educator and fine gentleman whom I can always recognize by the twinkle in his eyes and the pipe in his mouth."

The citation, printed on parchment, read as follows:

In Tribute to Thomas Diamond

Michigan's Adopted son, native of Scotland; champion, servant, and leader of industrial education — for his many contributions in his chosen field — and for his scholarly vision, kindly humor, and, above all, his tireless devotion to education in a free land.

Proffered in open meeting by *The Ship*, at the forty-third annual convention of the American Vocational Association in Atlantic City, New Jersey, December 9, 1949.

THE SHIP

Signed by Chester L. Messmore, captain; Alma Laird, deck officer; Richard H. Simpson; C. A. Roper; W. A. Banister; Todd Jones; E. Burnham Dunston.

♦ The following new officers were elected at the annual meeting of the Massachusetts Vocational Association: Paul J. Sullivan, Worcester Boys' Trade High School, president; Marion Balboni, department of education, Boston, vice-president; Kathleen G. Delaney, Lowell Girls' Vocational School, secretary; and Carroll Fuller, New Bedford Vocational High School, treasurer.

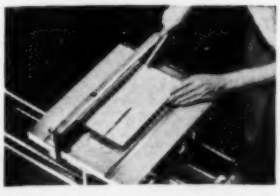
♦ The Executive Council of the Arizona Association of Future Homemakers of America met in

(Continued on page 66A)

SHOP TRAINING IN SMALL SCHOOLS NOW POSSIBLE WITH SHOPSMITH

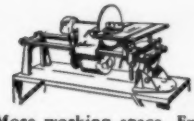
The Ideal Shop Training Tool, Tested and Approved by Shop Instructors

1—8" CIRCULAR SAW



Depth of cut 2¼". Big 14½" x 17" tilting table. Greater capacity—cuts to center of 8' plywood panels. Unique microquill adjustment for accurate cutting.

2—12" DISC SANDER

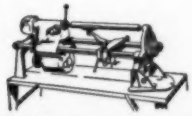


More working space. Extra features. Disc can be fed into work for safety and accuracy. Miter gauge and rip fence for easier squaring, mitering and jointing.

3—HORIZONTAL DRILL

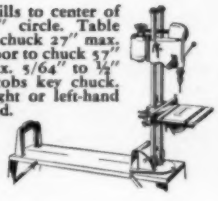
Only SHOPSMITH has it. Extremely useful when drilling or mortising large, heavy pieces. No need for jigs. Permanently grease-sealed ball-bearing action.

4—33" WOOD LATHE



33" between centers. 15" swing. 4" quill feed. Speeds 875 to 3500 rpm. Finger-tip adjustable tool rest always slides parallel to work, locks in any position.

5—VERTICAL DRILL PRESS



Drills to center of 15" circle. Table to chuck 27" max. Floor to chuck 57" max. 5/64" to ½" Jacobs key chuck. Right or left-hand feed.

$169.50 Saw guard not shown with special ½-HP motor.....**$199.50**

SPECIAL SCHOOL SAFETY GUARDS AVAILABLE

Now any school with 2 x 5 feet of available floor space and a $200 tool equipment budget can have a power workshop equal in quality and capacity to the largest and best-equipped school shops.

SHOPSMITH makes it possible with a circular saw, lathe, disc sander, vertical and horizontal drill press skillfully engineered into *one* rugged, multi-purpose unit. Easy to operate, SHOPSMITH converts from one tool to another *in less than sixty seconds.*

Here's capacity!—a saw that cuts to the center of 8-foot plywood panels, a drill press and sander that handle room-length work, a lathe that takes work up to 15 inches in diameter.

Here's flexibility! — SHOPSMITH makes the correct tool available for each job. For the first time it is possible to vary an assortment of power tools to fit periodic changes in shop requirements.

Here's quality!—four grease-sealed ball bearings, induction hardened spindle tip, centerless ground steel ways, a score of precision features that assure hairline accuracy, lifetime service.

Here's the first multi-purpose tool that meets every requirement for industrial arts or vocational training. See it at any Montgomery Ward, leading hardware or department store. And mail the coupon below for complete information on the school use of SHOPSMITH.

SHOPSMITH, *Dept. 121-U*

417 Montgomery St., San Francisco, Calif.

I am interested in SHOPSMITH and its application to industrial arts training. Please send me complete information.

*Name*_____ *Position*_____

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Only ATKINS makes "Silver Steel" SAWS

That's an important fact to remember when specifying any type of saw for school shop use. *"Silver Steel" Saws* — developed, perfected and manufactured only by ATKINS — are made of the finest, toughest, longest lasting steel ever alloyed for sawing operations. They have the *extra* stamina that keeps them cutting fast and clean — with minimum servicing — long after ordinary saws have worn out and been discarded. They are backed by 93 years of continuous research and scientific advancement! For saws that cost *less* because they last *longer*—that help students learn *faster* because they cut *better*—make sure the saws that go into your shop are Atkins "Silver Steel" Saws.

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ATKINS

OF ALL FINE SAWS — THE FINEST ARE "SILVER STEEL" SAWS

ASSOCIATION NEWS

(Continued from page 64A)

Phoenix on September 30 and October 1, 1949, to plan the program of work for the State Association, as well as for each state officer. Preliminary plans were also made for the state and district meetings. Carol Green, state president, met with Miss Freda Wilson, state adviser, to make final plans for the day and a half meeting. Fourteen of the 15 members of the executive council were present.

♦ Newly elected officers of the Oklahoma Vocational Association are as follows: Mrs. Ima Stewig, home economics, Coalgate, president; Ralph Barclay, distributive education, Duncan, vice-president; Virgil Huston, trade and industrial education, Bartlesville, vice-president; and High D. Jones, vocational agriculture, Oklahoma A. & M. College, Stillwater, secretary-treasurer.

Personal News

JOHN M. HURLEY APPOINTED ACTING DIRECTOR OF INDUSTRIAL ARTS AT NEW YORK

John M. Hurley has been assigned to the position of acting director of industrial arts in the Elementary and Junior High Schools of the board of education of the city of New York. Prior to this he was supervisor of industrial arts for five years.

Mr. Hurley was educated in Boston, Mass., and is a graduate of the Mechanic Arts High School and the Training School for Teachers of Mechanic Arts. He was also graduated from New York University where he is now completing work for his master's degree under the Charles Hendrick scholarship.

John M. Hurley

He holds office in national, state, and city teacher organizations, and was recently presented the annual award of the Brooklyn Guild, Teachers of Industrial Arts, for outstanding contributions to industrial-arts education.

RALPH D. FLEMING

Ralph D. Fleming, research assistant in the Bureau of Guidance, New York State Education Department, since 1939, and staff member since 1924, passed away suddenly in Albany on September 9, 1949.

HARRY E. MASTERS APPOINTED VOCATIONAL DIRECTOR

The L. S. Starrett Company of Athol, Mass., appointed Harry E. Masters as educational director in charge of all vocational education and industrial apprentice training programs and activities, as well as all trade shows and conventions. Mr. Masters is widely known among educators and brings to this full-time position more than forty years' experience in sales, educational work, and advertising. He was advertising manager for the past twenty years.

Harry E. Masters

THREE BROTHERS — ALL GRADUATES OF OSWEGO

Robert Ploeser of Staten Island and Oswego, N. Y., will be the third brother to be graduated from the Oswego State Teachers College, Oswego, N. Y., since 1934.

Bob started in January, 1947. He took the accelerated course and got his degree in January, 1950. He will continue with graduate work at the Colorado State College of Education at Greeley, Colo.

FOLEY *Automatic* SAW FILER

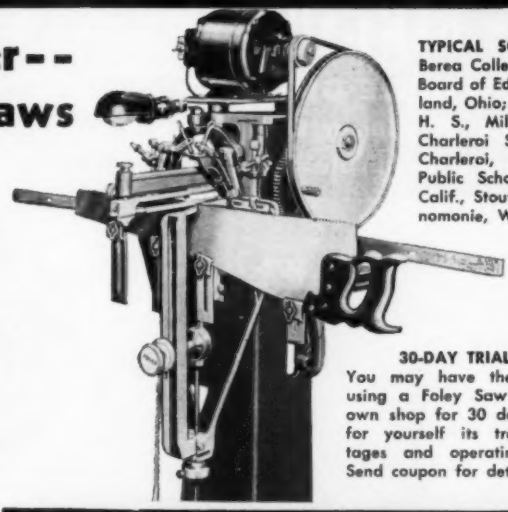
Trains Your Students Better-- DOUBLES Life of Your Saws

"ONE OF THE BEST MACHINES WE HAVE FOR TRAINING PURPOSES" —Samuel Gompers Trades School, San Francisco

The Foley is the only machine that files and joints all hand, back and mitre box saws from 3 to 16 points per inch, cross-cut circular saws up to 16" diameter (24" optional), and band saws up to 24' long. Patented jointing principle automatically evens up large and small teeth, so saws cut faster, truer, cleaner — stay sharp longer.

With a Foley Automatic Saw Filer you can sharpen your saws more perfectly than is possible by hand. You can do it quicker, — and your saws will stay sharp longer. Your students will turn out better work with sharp saws. ALSO by keeping your saws sharp with a Foley, — you will easily double their cutting life and have less breakage, reducing replacements to a minimum.

Train your students to file saws on a Foley, for they will find thousands of Foley Saw Filers used in industry, Army, Navy, Air Corps, etc. Hundreds of schools and colleges use them to save on saw filing costs and replacement expense.



TYPICAL SCHOOL USERS Berea College, Berea, Ky., Board of Education, Cleveland, Ohio; Boys Technical H. S., Milwaukee, Wis.; Charleroi School District; Charleroi, Pa.; Redlands Public Schools, Redlands, Calif., Stout Institute, Menomonie, Wis.

30-DAY TRIAL OFFER
You may have the privilege of using a Foley Saw Filer in your own shop for 30 days, — and see for yourself its training advantages and operating economies. Send coupon for details.

The FOLEY SAW FILER *Makes . . .*

an OLD SAW *LIKE NEW!*

Send in this Coupon

FOLEY MFG. CO., 3318 N.E. 5th Street Minneapolis 18, Minn.
Please send literature on the Foley Automatic Saw Filer and details of your 30-Day Trial.

Name .....

Address .....

PERSONAL NEWS

Al, the oldest brother, was graduated from Oswego in 1934. He is teaching shopwork at Bay Shore, Long Island, N. Y.

Bill was graduated in 1940, and teaches shopwork at Hastings-on-Hudson, N. Y.

This almost looks like a record. Can anyone top this?

♦ HOWARD B. HALL, formerly teacher of industrial-arts electricity at Wilbur H. Lynch High School, Amsterdam, N. Y., has been appointed principal of the Amsterdam Vocational School and supervisor of industrial arts in that city.

♦ DR. R. LEE HORNBAKE, professor of industrial education at the University of Maryland, and industrial-arts editor of the *American Vocational Journal*, has been awarded a fellowship at Harvard University, Cambridge, Mass., for post-doctoral study.

Dr. Hornbake earned his M.A. and Ph.D. degrees at Ohio State University. He will return to the University of Maryland for the 1950 summer session.

♦ RALPH C. WENRICH, associate superintendent, and head of the Michigan State Office of Vocational Education, has resigned as of July 1, 1950, to become the professor and chairman of the department of vocational education at the University of Michigan.

Mr. Wenrich was recently appointed member of the National Advisory Council on Vocational Education.

♦ Graduates of The Stout Institute, Menomonie, Wis., have accepted positions as follows: ROBERT BACHMAN, Milwaukee, Wis.; ROBERT CROWLEY, St. Paul, Minn.; JOHN HANSEN, La Crosse, Wis. (Sept.); ROBERT LYNCH, Green Bay, Wis.; JAMES PAYNE, La Crosse, Wis. (Sept.); RICHARD ROEPKE, Milwaukee, Wis.; JOHN ZIEGLER, Mobridge, S. Dak.; GEORGE NORTON, Council Bluffs, Iowa; ALVIN SCHMIDT, Flint, Mich.; WALTER VERNON, Vocational School, Kaukauna, Wis.; and MERLIN MOORE, Washburn, Wis.

♦ LEONARD CHARLES SILVERN has received the appointment as Safety Training Director, Division of Safety, State of New York, at Albany.

He was formerly training supervisor, New York Naval Shipyard, where he directed apprentice training, student training, artisan training, instructor training, and supervisory conference leading for the machine shops. He completed a four-year apprenticeship with the Navy Department as machinist; received his B.S. degree from Long Island College, Columbia University. Mr. Silvern will soon receive his doctor's degree at Columbia for research in the administration of adult education.

♦ JOSE C. SADDUL, superintendent of the Central Luzon Agricultural School, the largest and oldest regional agricultural school in the Philippines, is currently taking post-graduate work in Education at the Louisiana State University, specializing in vocational guidance and teacher training of vocational agriculture teachers.

♦ OLEN P. NAIL, vocational agriculture instructor in the schools of Mississippi, is now enrolled at the Louisana State University to complete work for his Ph.D. in agricultural education.

♦ HOLLIS H. TODD, who was director of vocational education in Amsterdam, N. Y., retired during the past summer. Mr. Todd has been an inveterate fighter for the underprivileged and slow learner groups of boys and girls in Amsterdam.

♦ JOHN CHARLES RIEDEL, chief engineer for New York City's Board of Estimate and Apportionment, will receive the Cooper Union Ninetieth Anniversary Alumni Award as the Cooper Union graduate who has done most for the city and the institution.

Presentation of the award will be made February 10 by Dr. Gano Dunn, president of Cooper Union, at the annual Founder's Day dinner.

Mr. Riedel was graduated from Cooper Union evening courses in 1898, and remained at Cooper Union as assistant to the head of the Physics Department, and as instructor and lecturer for evening classes in the Principles of Mechanics until 1935. His daytime employment, beginning while still a student, has been almost exclusively with New York City.

♦ LUIS ALFREDO SEPULVEDA of San Bernardo, Chile, is the first Latin American student to be awarded an industrial research fellowship at Armour Research Foundation of Illinois Institute of Technology.

Starting in February, Mr. Sepulveda will do graduate work at the Institute and industrial research in the applied mechanics department of the Foundation, each half time. He is working toward a degree of master of science in mechanical engineering.

The fellowship includes tuition at Illinois Tech and training in industrial research at Armour Research Foundation.

Mr. Sepulveda attended the Catholic University in Santiago, Chile, from 1932 to 1935. He is a 1941 graduate of the Aeronautical University in Chicago and has done graduate work at Illinois Tech.

♦ J. C. WOODIN, A.V.A. vice-president for industrial education, and Wichita, Kans., director of industrial and adult education, is a newly elected member of the board of directors of the Wichita Manufacturers' Club.

♦ HARRY W. LAWSON, director, Michigan Veterans Vocational School, Doster, has returned from Germany, where he completed a tour of duty for the U. S. Office of Military Government as a visiting expert on vocational education.

♦ GEORGE E. YETMAN, formerly apprentice at Norfolk, Mass., and a graduate of the University of Massachusetts, 1949, has accepted a position as agricultural instructor at Bacon Academy, Colchester, Conn.

(Continued on next page)

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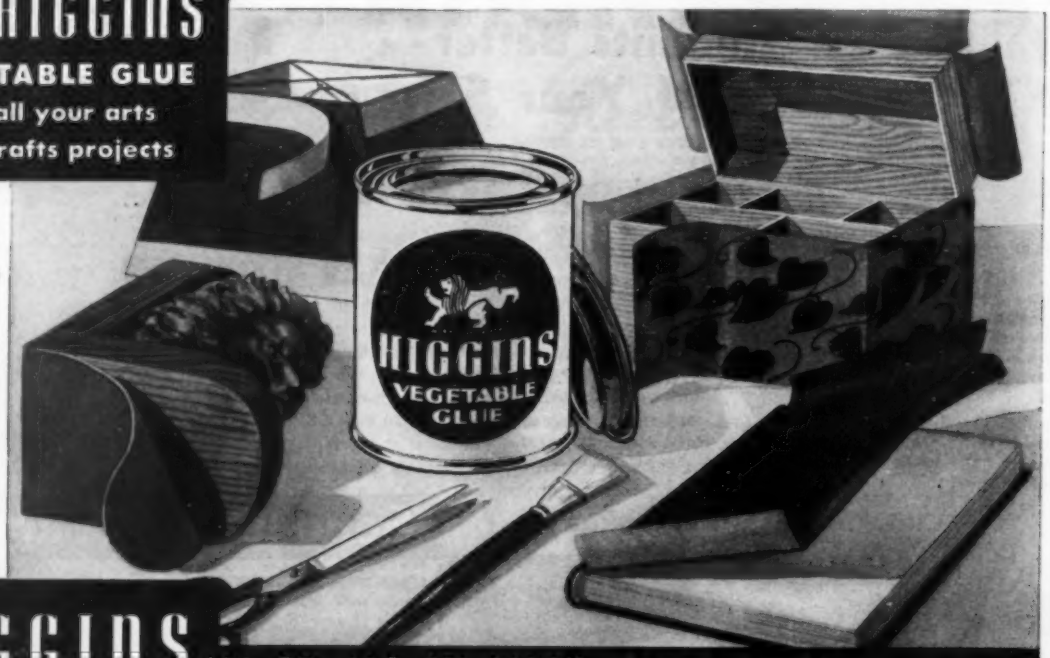

HIGGINS INK CO., INC. 271 NINTH STREET, BROOKLYN 15, N. Y.

PERSONAL NEWS

(Continued from previous page)

♦ CLARENCE R. FERDUN, formerly supervisor of occupational information and guidance service, has been made supervisor of agricultural education of Hawaii.

♦ CECIL JOHNSON is teaching general metal shop at Beall High School in Frostberg, Md.

♦ JAMES L. MCGINTY, formerly of Chester, Pa., is now teaching industrial arts at the High School in Brownsville, Pa.

New Publications

General Occupational Education for Some of the Sixty Per Cent

Paper cover, 98 pp., 8¼ by 11 in., mimeographed, $1. Only a limited number available.

A serious attempt to outline an elective general industrial-arts curriculum for the senior high school, that will more effectively function in meeting the needs of the 60 per cent.

The work was done by seminar students at the Pennsylvania State College under the guidance of John F. Friese, professor of industrial-arts education.

Projects With Instructions for Metal Crafts

By Karl F. Ufer. Cardboard cover, 30 pp., 8½ by 11-in. folio, $1.50. Adax Co., 50 Church St., New York 7, N. Y.

These projects, which include rings, bracelets, trays, candelabra, lantern, letter box, fire screen, and tools, lawn table, and the like, are excellently designed and quite suitable for the student at school, and the home craftsman.

Silhouettes and Designs for Metal Crafts for Chasing, Saw Piercing, and Etching

Cardboard cover, 30 pp., 8½ by 11-in. folio, $1.50. Adax Co., 50 Church St., New York 7, N. Y.

A fine series of good design that can be used for decorating metal, plastics, wood, and leather projects.

General Mechanical Drawing

By William Jervis. Cloth, 201 pp., 6⅛ by 9¼ in., illus., $2.75. International Textbook Co., Scranton, Pa.

A text employing a psychological approach to the subject of drawing. The projects selected are within the scope and skills of high school students.

The course is truly exploratory and leads the student through floor plans; map drawing graphs; orthographic projection; and working, assembly, and pictorial drawings; developments; and geometrical constructions.

Applied Course for Student Printers

By Merle A. Clark. Paper cover, 95 pp., 6¾ by 9½-in. worksheets, $2.40. Published by Chas. A. Bennett Co. Inc., 237 N. Monroe St., Peoria, 3, Ill.

A text for the print shop consisting of 95 worksheets. The book contains a very helpful course outline which will help the teacher adapt it to cover industrial-arts work for a vocational course. The material can also be arranged for a two- or a three-year course.

The text also is arranged so that each student can progress at his own speed. The worksheets are in loose-leaf form punched for a binder.

Carbide Cutting Tools

By Warren Baker and Joseph S. Kozacka. Cloth, 416 pp., 5¾ by 8½ in., illus., $3.50. American Technical Society, Chicago, Ill.

An exhaustive treatment of a subject which is of great interest and value to vocational students and metalworking mechanics.

Carbide cutting tools are comparatively new in the industrial world and this book will be of great assistance to those interested in adopting their use, or designing new applications for them.

Educational Craftwork in Wood

By P. Yabsley. Cloth, 164 pp., 5¾ by 8⅝ in., illus., $2.50. B. T. Batsford, Ltd., New York, N. Y.

A collection of excellent small woodworking projects which will please many teachers. The fact that the drawings are all made in first angle projection may cause slight trouble to some of the readers.

Part I of the book contains descriptions of 45 projects with accompanying working drawings and photographs.

Part II has a fine description of the structure of wood, how to steam and bend it, and how to finish it in various ways.

Shop Safety Education

By J. James Jehring and Frederick Theurer, University of the State of New York, 1949. Cardboard, spiral binding, 336 pp., 7¾ by 10¼ in., illus., $2.55; cloth bound edition, $3.30. Delmar Publishers, Inc., Albany 1, N. Y.

The primary objective of this new book is to train the students in school shops on how they can avoid accidents in industry, in the home, and on the farm. Tested accident prevention techniques are recommended for use by school shop teachers to insure a quick transfer of safety habits from school to actual employment conditions.

(Continued on page 70A)

INDUSTRIAL WORKER'S LIFE SPAN

(Continued from page 62A)

dislocations. Millions of people migrated to war production centers, worked long hours at unaccustomed jobs, and lived in overcrowded quarters. Still the record high of longevity was established by the industrial population.

Two factors have contributed materially toward bringing about this favorable condition, according to the Metropolitan Life Insurance Company: the generally raised standard of living resulting from full employment at relatively high wages; and the widespread use of sulfa drugs and penicillin in the treatment of a large variety of infections.

The mortality among the colored continues to be much less favorable than that for white policyholders, particularly at the ages of adolescence and early maturity. Thus the expectation of life at the age of 5 years is 57.15 years for colored males against 60.56 for white males, and it is 60.16 years for colored females against 66.46 years for white females.

Males and Females

As for longevity, there is a remarkable natural difference between the male and female sex. Women and girls are healthier through the whole life, and they live longer — they have a lower mortality from the day of their birth.

This, of course, has decisive consequences. Due to a strange law of nature always more boys are born than girls — in every country of the world. Approximately 1061 boys are born for 1000 girls. But from the beginning boys are the weaker sex, more boys die than girls, and at the age of twenty years the number of boys and girls is about the same (excluding deaths from warfare and other abnormal conditions). Through the whole life more women remain living than men. Those are statistical facts which may be supported by a practical experience: every one of us knows a good many more widows than widowers. Women live longer than men.

This fact is again being proved by the new figures of the Metropolitan Life Insurance Company. The expectation of life in the industrial population is higher for the female sex. A young girl of five years has a life expectancy of 66.46 years, while a boy of the same age group has a life expectancy of only 60.56 years. And so it goes through the years: at fifty years a woman has a life expectancy of 24.76 years, a man of only 21.04 years.

Causes of Longer Life

The main reason why people live longer today are improvements in the hygiene of everyday life. The housing situation though bad at present in many countries, is incomparably better for the mass of the people than in the Middle Ages or even half a century ago. The dangers of epidemicy can be limited in most cases. Better nutrition and better social care are other helpful factors. The hazards of pregnancy, birth, and childbed are infinitely smaller in our time. Many more infants remain living through our improved knowledge of the necessities of infant nutrition.

Other reasons are the progress made in medicine and surgery during the past few decades, with serum treatment and endoscopy, technical improvements in surgery and the new chemical drugs including sulfa drugs and penicillin. Insulin, discovered in 1922, has given a longer life and full occupational efficiency to innumerable diabetics who previously had been and felt like invalids.

Working conditions in industry have improved remarkably, many laws protect the health of the worker, prevent child labor; poisonous materials are eliminated from shops and factories and where this cannot be done, extraordinary precautions are made for protection of the workers handling the toxic materials. Industry has interest in and understanding for occupational diseases and industrial hygiene.

Nobody will say that things are 100 per cent perfect everywhere, but in the majority of industrial working places, both large plants and small shops, things have improved decisively since the beginning of the twentieth century. That is the reason why industrial workers now live as long as the average man of the total population and why their life has been extended to the same degree as for the average man. There is security that these improvements will not disappear again, and there is well-founded hope that with improvements in living and working conditions the average length of life will be extended even beyond the 65 years that has been reached today.

FEELINGS THAT HELP STUDENTS LEARN

HOMER C. ROSE
Curriculum and Instructor Training Section
Navy Department, Bureau of Naval Personnel
Washington, D. C.

Feeling of Being Respected by Others

1. Doing work he can do well.
2. A member of a *good gang*.
3. Importance of work made known by instructor.
4. Credit given for good work.
5. Doing useful work and doing it well.

Physical Comfort

1. Rested and ready for work.
2. Clean, well-lighted working conditions.
3. Safe, well-organized tools and equipment.
4. Seated for most talks and demonstrations.

Feeling of Accomplishment and Success

1. Records kept so that he knows how well he is doing.
2. Projects or problems are practical and *worth doing*.
3. Assignment reasonable so that success is possible.
4. Problems increase in difficulty from day to day and are always challenging.

DEATH RATE OF WORKERS HITS LOWEST POINT

Out of every 100,000 workers in the nation, 29 were killed in occupational accidents during 1948.

The National Safety Council said this represents an improvement from a rate of 30 per 100,000 in 1947, and is the lowest occupational fatality rate since these records were started in 1933.

Death rates in 1948 were lower than in 1947 for all of the major industries except agriculture. Actual deaths in agriculture increased only slightly, but a drop in the number of employed persons resulted in a rate increase.

Deaths and death rates of workers in major industries in 1948 were:

	Total Deaths	*Deaths per 100,000 Workers*
Trade	1,500	14
Service	2,200	15
Manufacturing	2,600	16
Public utilities	400	29
Transportation	1,500	48
Agriculture	4,400	55
Construction	2,500	93
Mining, quarrying oil and gas wells	1,400	154

Working time lost during 1948 due to disabling injuries was about 275,000,000 man-days. The Council said the loss was equivalent to the working time of approximately 1,000,000 men for a full year.

Occupational injuries cost the nation about $2,650,000,000 last year, the Council said. Of this amount about $1,350,000,000 was the immediately visible costs to both workers and industry. — *Safety News.*

The U. S. rate in 1948 was 67.1 deaths per 100,000 population, as compared to a world-wide postwar average death rate of 48.9, according to the 1949 edition of "Accident Facts," statistical yearbook of the National Safety Council.

Print-Shop Equipment

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

BELLOWS
- *a*) Hand, small size
- *b*) Electric, blower type

BLACKBOARD — permanent or portable

BOOKCASE — for reference books, catalogs, etc., sectional preferable

BRAYER — 6 or 8 in. for proofing

BRUSHES
- *a*) Bench
- *b*) Benzine, No. 1, oval black
- *c*) Floor
- *d*) Padding, 1½ in. wide

BULLETIN BOARD

CABINETS
- *a*) Galley, for double column, wood or steel, four tiers (to be used with typesetting machines)
- *b*) Galley, for 8¾ in. by 13 in. galleys, wood or steel, four tiers
- *c*) Ink and roller, to accommodate platen-press rollers, wood or steel
- *d*) Matrix, for use with typesetting machines only
- *e*) Roller, cabinet or rack for cylinder rollers
- *f*) Supply, for leads, slugs, spaces, strip material, with top for lead cutter and mitering machine
- *g*) Type, school type, each to accommodate two California cases, job cases, case slides, galley slide, and copyholder
- *h*) Type, complete with 24 full-size California job cases, with overhead lead-and-slug cases, wood
- *i*) Type, complete with 24 full-size California job cases, double work band, wood or steel
- *k*) Wood or metal, for filing class records, instruction sheets, etc.
- *l*) Storage for cuts

CANS
- *a*) Benzine, pint size
- *b*) Benzine, 5-gal. size
- *c*) Kerosene, safety, 1-gal. size
- *d*) Waste can, fireproof, for rags

CASES
- *a*) Blank, full-size, to accommodate ¼-size cases
- *b*) Border, ¼ size, for ornamental borders
- *c*) Lead and slug, regular size, to hold laborsaving fonts of leads and slugs
- *d*) Metal furniture, to hold laborsaving fonts
- *e*) Rule, ¼ size, for brass rule

CHAIRS — teacher's and tablet arm

CHASE RACKS
- *a*) For platen presses
- *b*) For cylinder presses

CHASES
- *a*) For each size of platen press
- *b*) For cylinder press

COMPOSING STICKS — 6 by 2 in., 8 by 2 in., 12 by 2 in., and 18 by 2 in., adjustable

CUTTER
- *a*) Lead and rule
- *b*) Paper, lever type, 20 in., with pedestal. Should handle 20 by 26-in. sheet
- *c*) Paper, lever type, 26 in. or 30 in.
- *d*) Paper, lever type, 30 in., with divided back gauge
- *e*) 30 in. to 36 in. power cutter

DESK
- *a*) Bindery, 80 by 36 in.
- *b*) Drying rack
- *c*) Imposing, 51 by 39
- *d*) Make-ready, 32 by 24 in.
- *e*) Paper cutters, 80 by 36 in.
- *f*) Proofreaders
- *g*) Teachers

DRYING RACKS
- *a*) Combination drying rack and stock table for platen presses, 30 trays
- *b*) Trays, interlocking, for cylinder press

FOLDING BONES — for hand folding

FOLDING MACHINE — 20 by 26-in. size, 4 fold, two parallel and two right-angle folds, power

FURNITURE — iron, 2 by 4 to 10 by 15 picas

GALLEYS — Steel, 8¾ by 13 in., 6¼ by 23½ in., double column, and 12 by 18 in.

GAUGE PINS — spring tongue

GLUE POT — electric, 1-qt. size

IMPOSING TABLES
- *a*) 12 by 18 in., with iron top, including reglets and furniture
- *b*) 24 by 36 in., with iron top, complete with galley slides, chase rack, reglets, and furniture
- *c*) 36 by 48 in., with iron top, complete with galley slides, chase rack, reglets, and furniture
- *d*) 39 by 63 in., with iron top, complete drawers, letter boards, reglets, and furniture

INK FOUNTAINS
- *a*) Short, for 8 by 12, 10 by 15, and 12 by 18 presses
- *b*) Long, for 10 by 15, and 12 by 18 presses

KNIVES
- *a*) Overlay, for make ready
- *b*) Ink, 6 in. and 8 in.
- *c*) Ink, 8 in., square end

LEADER BOXES

LEADERS
- *a*) 6, 8, and 10 pt., fine dot
- *b*) 8 and 10 pt., hyphen

LINE GAUGES
- *a*) Metal, brass, or steel
- *b*) Wood

MALLET

METAL FURNACE — for recasting and refining type metal, used only with typesetting machines

MITERING MACHINE

NUMBERING MACHINES
- *a*) For use on presses
- *b*) Hand machines

ORNAMENTS
- *a*) Assorted floral and decorative designs
- *b*) Border, 6 and 12 pt., decorative

PAPER-DRILLING MACHINE

PERFORATOR
- *a*) 24 in., foot treadle
- *b*) 28 in., foot treadle

PLANER
- *a*) Mallets, hickory or fiber
- *b*) Proof, maple, with felt bottom
- *c*) Type, maple, with leather top

PRESSES
- *a*) Cylinder, two revolution, four roller, 17 by 22, complete with variable-speed motor, cast rollers, etc.
- *b*) Platen, 8 by 12, with foot treadle, counter, flywheel guard, platen guard, brake, and set of cast rollers (motor and treadle combination if desired)
- *c*) Platen, 10 by 15, complete with variable-speed motor, counter, flywheel guard, brake, and set of cast rollers, etc.
- *d*) Platen, 12 by 18, complete with variable-speed motors, counter, flywheel guard, platen guard, brake, and set of cast rollers, etc.
- *e*) Proof, 14 by 18, with cabinet
- *f*) Proof, 20 by 24, with cabinet
- *g*) Proof, 23 by 24½ with cabinet
- *h*) Tableting

PUNCH
- *a*) Foot power, multiple with assorted punches
- *b*) Lever, two die, with assorted punches
- *c*) Power, multiple, with assorted punches (paper drill may be substituted)

QUOINS
- *a*) Sizes No. 1 and No. 2
- *b*) Keys, Sizes No. 1 and No. 2

RULE — plain and brass (fonts to fit quarter cases)
- *a*) 2 pt., laborsaving, hair line, side face
- *b*) 2 pt., laborsaving, 1 pt. side face
- *c*) 1 pt., laborsaving, 1 pt. face
- *d*) 2 pt., laborsaving, double face

SAW TRIMMERS — pedestal type, with point gauge, and raising and lowering table

SILK-SCREEN UNIT

SPACING MATERIAL
- *a*) Iron furniture, as selected
- *b*) Leads, laborsaving, 2 pt.
- *c*) Leads, 2-ft. strips, 2 pt.
- *d*) Slugs, laborsaving, 6 pt.
- *e*) Slugs, 2-ft. strips, 6 pt.
- *f*) Spaces and quads
- *g*) Thin spaces, brass and copper, assorted sizes, 6 to 8 pt., one size in each box

SPECIMEN DISPLAY BOARD

STAPLE BINDER — pedestal type, foot power

STEREOTYPING UNIT, 8 by 12 in.

STITCHER — wire, power, capacity ½ in. or ¾ in., flat- and saddle-back tables

TWEEZERS — 3½ in.

TYMPAN PAPER (with combination holder and cutter)
- *a*) 18 in.
- *b*) 38 in., upright, to be used with cylinder press only

TYPE
- *a*) Body, lightface — 8 and 10 pt.
- *b*) Job, lightface — 6, 8, 10, 12, 14, 18, 24, 30, 36, and 48 pt.
- *c*) Job, lightface italics — 8, 10, 12, 14, 18, 24, and 36 pt.
- *d*) Job, boldface — 6 and 8 pt.; 12 pt., No. 26; 12 pt., No. 27; 12 pt., No. 28; 18 pt., No. 30
- *e*) Job, light copperplate Gothic — 6 pt., Nos. 1, 2, 3, 4; 12 pt., Nos. 5, 6, 7, 8
- *f*) Job, condensed title Gothic — 12, 18, 24, 36, 48, 60, and 72 pt.
- *g*) Job, text type — 10, 12, 14, 18, and 24 pt.
- *h*) Job, typewriter type — 12 pt. with spaces
- *i*) Job, boldface italic — 8, 10, 12, 14, 18, 24, 30, and 36 pt.
- *k*) Job, heavy copperplate Gothic

(Continued on page 72A)

NEW PUBLICATIONS

(Continued from page 68A)

Contents include accidents and accident prevention; administration of the school shop safety program; making the school shop a safe place to work; guarding machinery; maintaining a safe place to work; personal protection devices; accident prevention with problem students; hand tool and electric portable tool safety; safe practices in certain kinds of shops; installing an effective accident prevention program; promoting industrial safety by public agencies.

This new publication furnishes a workable guide for every administrator or instructor under whose direction shop programs are carried out. It should also find a warm welcome in teacher training institutions, and wherever industrial safety courses are offered.

The Management Guide

By George Lawrence Hall. Cardboard, spiral binding, 74 pp., 6¼ by 9 in., illus. Distributed free to colleges of business administration. Put out by the Standard Oil Company of California, San Francisco, Calif.

This book describes the use of management guides in conducting the affairs of a large corporation composed of many departments.

Among the topics covered are the need and use of job description forms, the delegation of responsibility and authority, pointers on how to prepare management guides, and their proper use.

For purposes of illustration, a hypothetical corporation has been described. Sample management guides for key positions from the president down are presented as examples of the method used by Standard in explaining the responsibilities and authority of management positions.

It contains a number of organization charts which may be found very helpful.

Learning Electricity and Electronics Experimentally

By Leonard R. Crow. Cloth, 525 pp., 5¾ by 8¾ in., illus., $4.40. The Scientific Book Publishing Co., 530 South 4th St., Vincennes, Ind.

A book which presents the theory of electricity, electromagnetism and induction, by the aid of constructing and using numerous electrical devices.

A number of experiments for the student to perform have been placed at the end of each chapter.

Introductory Radio — Theory and Servicing

By H. J. Hicks. Cloth, 393 pp., 6¼ by 9⅛ in., illus., $3.20. The McGraw-Hill Book Co., New York City.

A textbook for beginners which explains the elements of electricity and magnetism and then goes into the mysteries of the vacuum tube, audio amplifiers, power supplies, amplitude-modulated radio receivers, frequency-modulated radio receivers, loud-speakers, public-address systems, and antennas.

The course is built on the idea that the student is interested primarily in radio — not theory; hence, some shopwork is introduced on the first day. Theory, however, is not ignored, and the student learns not only the *how* of radio, but the *why* as well.

How to test and shoot trouble also is explained and the book contains a fine chapter on television.

Aircraft Maintenance and Service

By Col. R. H. Drake. Cloth, 352 pp., 6⅜ by 9½ in., illus., $6. The Macmillan Co., New York City.

A nontechnical book which presents in understandable language what the student and mechanic should know about aircraft maintenance and service.

The 22 chapters describe the parts of the airplane; how to proceed in making inspections; doing maintenance work; using glues, dopes, and finishes; woods, metals, and alloys; fabric-covered and plywood construction; wood and fabric repairs; welded repairs; drilling, burring, filing, and riveting; and sheet-metal forming and repairing.

The book also contains a glossary.

Practical Television Servicing and Trouble Shooting Manual

By The Technical Staff of Coyne Electrical and Radio-Television School, 500 So. Paulina St., Chicago 12, Ill. Cloth, 392 pp., 5¾ by 8½ in., illus., $4.25.

This book, written by members of the technical staff of the Coyne School, provides radio students and radio servicemen with information on how to apply the knowledge they already possess in the servicing of television receivers.

The book is written in simple understandable language, and in co-operation with leading television manufacturing firms so that its contents can be directly applied to the solution of today's servicing problems.

The book also contains a good, practical explanation of color television, and this section, printed in color, presents the reader with a clear understanding of this subject which is arousing so much interest today.

Encyclopedia of Vocational Guidance, Vol. II

Edited by Oscar J. Kaplan. Cloth, pp. 723 to 1422, 5½ by 8¼ in., The Philosophical Library, Inc., 15 East 40th St., New York, N. Y.

A very voluminous résumé of vocational guidance facts, methods, information, and evaluation of tests of mechanical and manual ability, space relationships, ability, assembly, finger dexterity, structural visualization, prognostic, medical aptitude, aptitude for metalworking occupations, military career, for the ministry, motion pictures, music, teachers, nurses, etc.

The book also presents information about occupations, and personality and adjustment inventories, and numerous scales and tests of various kinds.

Practical Hooked Rugs

By Stella Hay Rex. Cloth, 173 pp., 5½ by 8⅛ in., illus., $2.95. Ziff-Davis Publishing Co., 350 Fifth Ave., New York City.

An interesting text on an interesting subject. The author, who has taught this subject, gives a clear explanation of the techniques and equipment; shows how to choose patterns, materials, colors, and dyes; lay out scrolls, background, and borders; and care and clean the rugs to preserve them for a long and useful life.

PRINTING touches life at so many points! Into whatever vocation the boy or girl grows, a knowledge of printing is fundamental.

Besides, a graphic arts course often enables a student to discover and give direction to his natural talents. This may lead him into the printing industry itself, which includes four out of the ten highest paid crafts. Or it may inspire him to seek self expression in fields where familiarity with and appreciation of the principles of printing are invaluable assets.

ATF, with its long-established and richly-experienced Department of Education, is ready at all times to consult with school officials on printing departments and their important place in today's curricula.

AMERICAN TYPE FOUNDERS

Department of Education

200 ELMORA AVENUE, ELIZABETH B, NEW JERSEY

An ATF Associate

Pamphlets of the Personnel Series

Published by the American Management Association, 330 West 42nd St., New York 18, N. Y. Cost, 75 cents per copy.

No. 124. The Practical Meaning of Management Statesmanship.

No. 125. What to Expect in Union Demands, and the Outlook for Labor Legislation.

No. 126. What's Ahead in Employee Health and Pension Planning.

No. 127. Identifying and Developing Potential Leaders.

Working With People

By Auren Uris and Betty Shapin. Cloth, 311 pp., 5⅝ by 8¼ in., $3. The Macmillan Co., New York City.

A study of human relations. It discusses what workers want of their jobs, how they live their private lives, what they expect of the employer and his supervisory force, how to make criticisms in the proper way, how to hire workers and how to get teamwork out of them, how to give orders and make them effective, and how to overcome resistance to change.

The book is interestingly written and presents many human interest stories that make the contents more understandable.

College Building Needs

Paper, 58 pp., 7⅝ by 9¼ in., illus., 25 cents. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

Annual Report of the General Superintendent, Chicago Public Schools, Chicago Schools Journal, Volume 31, No. 1, Sept., 1949.

LEATHERCRAFT

TECHNIQUES AND DESIGNS

By John W. Dean

AN advanced manual of leather work, reflecting thirty years of experience in leather work and teaching leathercraft. Five major sections: Leathers, and Tannages; Tools; Processes; Designs; Projects. Contents include: weights and grades of leather; buying leather; modeling tools, special modelers, stipplers; stamping tools; incising knives; cutting leather; punches; spacing gauges; tooling; stamping; coloring; cementing; sewing; lacing; design sources; patterns. Projects and designs include: Purses; key cases, scissors cases; picture frame; small handbag; memo book cover; table mats; belts; book covers; wall plaques; album cover; handbags; portfolio and many other valuable projects. Write for approval copy. $5.00. Clip this.

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- ☐ MACHINE SHOP PROJECTS—by Knight. 25 projects in blueprint form $1.00
- ☐ ENGINE LATHE OPERATION—Whipple & Baudek. Working manual, beginners $1.60
- ☐ BLUEPRINT READING, Checking, Testing—by Steiniko. Part I: instructions & questions; Part II: 39 double plates in blueprint form $2.00
- ☐ READING AIRCRAFT BLUEPRINTS—Goff & Novak. For beginners..$2.00
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- ☐ GENERAL LEATHERCRAFT—Cherry. Easy to understand.....$1.20
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- ☐ MACHINE WOODWORKING—Smith. Revised 1948.....$2.75
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(Continued from page 70A)

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- v) Laborsaving metal furniture
- w) Thin spaces with quarter-em case

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- a) Either linotype or intertype, 2 or 3 magazines, and molds
- b) Matrices for same, 6, 8, 10, and 12 point, as selected

VISUAL AID CHARTS

Print-Shop Supplies

BENZINE OR GASOLINE — for cleaning type or presses

BINDERY TAPE — 2 in. wide, brown or black

GOLD BRONZE — pale

INK
- a) Bond, black, for bond papers
- b) Book, black, for school papers, etc.
- c) Cover, colors as selected
- d) Dryers and compounds, as selected
- e) Half tone, black
- f) Job, colors as selected
- g) Metallic, gold and silver
- h) Process, black, red, yellow, blue

KEROSINE — for cleaning rollers

PADDING CEMENT
- a) Cold
- b) Hot

PAPER
- a) Bond, fine grade, 17 by 22 — 20, white
- b) Bond, medium grade, 17 by 22 — 20, white
- c) Bond, sulphite, 17 by 22 — 20, white
- d) Bond, sulphite, 17 by 22 — 20, colors as selected
- e) Book, enamel, 25 by 38 — 80, white
- f) Book, machine finish, 25 by 38 — 80, white
- g) Book, eggshell finish, 25 by 38 — 60, white
- h) Cover, as selected, 20 by 26, medium
- i) Card Bristol, fine grade, 22 by 28 — 4 ply, white
- k) Index Bristol, medium grade, 25½ by 30½ — 110, white
- l) Index Bristol, medium grade, 25½ by 30½ — 140, white
- m) Mill Bristol, medium grade, 25½ by 30½ — 140, colors as selected
- n) Pressboard, red
- o) Strawboard, No. 40 or No. 50
- p) Tagboard, manila, 24 by 36 — 140
- q) Tympan, to fit presses
- r) Wrapping paper, size as selected
- s) Holder for same

PASTE
- a) Bindery
- b) Make ready

SILK-SCREEN SUPPLIES consisting of:
- a) Silk-screen process paste paint, 1 each of the following colors: toluidine red, strontian yellow, ultramarine blue, medium green, rich brown, orange, purple, white, and black
- b) Solvent profilm in 11- by 14-in. sheets
- c) 8-in. synthetic squeegee
- d) 11-in. synthetic squeegee
- e) No-clog varnish
- f) Film solvent
- g) Stencil filler
- h) Filler remover
- i) Stencil knife
- k) Fiber guides
- l) Red sable brush — ½ in.
- m) Putty knife
- n) Frame tape

TWINE — cotton, for tying jobs

WIRE STITCHING
- a) No. 28 round wire for stitcher
- b) Wire staples, ¼ in.

Drafting Equipment and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

ADJUSTABLE-CURVE RULER

BEAM COMPASS

BENCH BRUSHES

BLACKBOARD
- a) Permanent or portable
- b) Compass, 15 in., with locking device
- c) Drawing set: T square, straightedge, triangle, and protractor

BLUEPRINT
- a) Frame or machine
- b) Washing trays or washer
- c) Paper tube, airtight
- d) Drying rack or dryer

BOOKCASE

CABINET
- a) For filing drawings

(Continued on page 74A)

News Notes

NEW PUBLICATIONS FROM THE WASHINGTON AVA OFFICE

Two bulletins published by the AVA during the past two months bring together information for which there has long been a need. For the benefit of those who have not yet seen these valuable publications, a brief description follows.

"Studies in Industrial Education" is a compilation of the contributions in the field of industrial education which have been made by graduate students and experienced teachers working for advanced degrees. The 2002 studies listed, cover those made in industrial-arts education, vocational industrial education, and technical education. The bibliography also makes available to teachers a ready source of information not available in standard textbooks and provides school administrators with sources of data that will have direct bearing upon the many aspects of their work. The Committee on Research and Publications of the AVA and a Research Committee from the National Association of Industrial Teacher Trainers worked together to complete this compilation.

"Service Areas for Vocational Schools" is a guidebook for general and vocational school administrators interested in enlarging vocational programs to provide more people with more varied and better vocational education opportunities. Factors to be considered in implementing a sound area vocational program as well as descriptions of different types of area organizations now in operation are included. The 36-page booklet constitutes a most valuable piece of reference material for persons contemplating the expansion of vocational programs.

The price of "Studies in Industrial Education" is $1 and "Service Areas for Vocational Schools" is 25 cents. Both may be obtained by writing to L. H. Dennis, executive secretary, American Vocational Association, 1010 Vermont Ave., N.W., Washington 5, D. C.

♦ The National Conference on High-School Driver Education, held at Jackson's Mill, West Virginia, October 2–5, 1949, provided educators an opportunity to develop guiding policies and recommendations that will promote the growth of driver education programs.

An 80-page report of the conference includes policies and recommendations on:

The Place of Driver Education in the High-School Curriculum
- Purposes and objectives of driver education

Instructional Planning
- Criteria for selecting learning experiences
- Methods of instruction
- Instructional materials and opportunities

Organization and Administration
- Legislation concerning driver education
- Financing driver education
- Types of programs
- Minimum time for driver education
- Grade placement
- Teaching requirements, salary, and load
- Obtaining and using automobiles
- Areas for practice driving
- Credit
- Driver licensing
- Adult driver education
- Public relations
- Records and reports

Teacher Qualifications, Preparation, and Certification
- General and special qualifications
- Areas of teacher selection
- General and special preparation
- Administrative knowledge for teachers
- Pre-service and in-service education
- Certification

Evaluation and Research
- Techniques of evaluating driver education
- Suggested problems for research

Also included are:
- Resolutions adopted by the conference
- Excerpts from studies of the results of driver education programs
- Sample agreement forms for use in obtaining automobiles
- Names of conference participants

Single copies at 50 cents each may be obtained from the National Education Association, 1201 — 16th St., N.W., Washington 6, D. C.

♦ General Motors Institute announces its Auto Mechanics Teacher Training Program in two sections for the summer of 1950. The courses, for college and high school instructors of auto mechanics and service subjects, will run from June 26 to July 21, and from July 24 to August 18.

Throughout the program current models of Chevrolets, Pontiacs, Oldsmobiles, Buicks, Cadillacs, GMC Trucks and Detroit Diesel engines are available for use as instructional aids, and trips to General Motors plants and laboratories are so co-ordinated as to make them an integral part of the program. Application for enrollment may be obtained by writing to the Registrar, General Motors Institute, Flint, Mich.

♦ Volume VI, No. 3 "Hobart Arc Welding News," a 24-page booklet chock-full of interesting photographs and articles on welding from all over the country, is now available. It will be mailed free of charge to anyone interested in arc welding. The Hobart Brothers Company, Troy 1, Ohio.

♦ The New York State School of Industrial and Labor Relations at Cornell University, Ithaca,

(Continued on page 77A)

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(Continued from page 72A)

b) For storing drawing boards
c) For storing drawing instruments
d) For storing models

CALIPERS — 6 in. and 8 in., inside and outside
CHAIR — teacher's
DESK — teacher's
DIVIDERS — proportional
DRAFTING MACHINE — and accessories
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DRAWING TABLES AND STOOLS
a) For students
b) For teachers
INK-BOTTLE HOLDER
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LEVEL OR TRANSIT — builders' for architectural students
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MARKING PINS — for use with measuring tape, for architectural students
MICROMETER — 1 in., for mechanical-drafting students
OILSTONE — 3-in. case
PANTOGRAPH — 21 in.
PARALLEL RULES
PLANIMETERS
PLUMB BOB
SHEARS — for trimming blueprints and drawings
SPEED COUNTER — for mechanical-drafting students
STEEL SCALES — 12 in.
STOP WATCH — for mechanical-drafting students
TABLE
a) For cutting and trimming drawings and blueprints
b) For disassembling and reassembling machine parts and models
TAPELINE
a) 100 ft., steel, for architectural students
b) 50 ft., steel or metallic
TOOLBOX — containing 1 machinists' hammer, one 6-in. adjustable wrench, one 6-in. screw driver, one 6-in. combination pliers
TRIANGLES
a) 30-60 deg., 14 in. transparent
b) 45 deg., 10 in. transparent
TRIANGULAR SCALES — civil engineers' type, 12 in.
T SQUARE — adjustable or fixed head, for large drawing board or straightedge with parallel rule attachment for large drawing boards
WALL CHARTS — lettering, decimal equivalents, etc.
YARDSTICK
To be provided by, or for, each student

Drafting—Small Equipment

DRAWING BOARD — size to be specified by instructor
DRAWING INSTRUMENTS — as specified by instructor
ERASING SHIELD
IRREGULAR CURVE — Nos. 8 and 13, transparent
PENCIL COMPASS
PENHOLDER — for lettering pens
PENS — assorted, for lettering
PROTRACTOR — not over 5 in.
SCALE — 12 in. architects', triangular
SCALE GUARD
SLIDE RULE — 10 in., as specified by instructor
T SQUARE — to fit drawing board
TRIANGLES — 30-60 deg., 10 in. transparent, and 45 deg., 8 in. transparent

Drafting Supplies

BICHROMATE OF POTASH — crystals
BLUEPRINT
a) Paper, 36 in. wide
b) Writing fluid
PAPER
a) Cross section, 8½ by 11 in.
b) Detail, 24 by 36 in.
c) Drawing, 24 by 36 in.
d) Isometric, 7 by 10 in.
e) Tracing, 36 in.
POWDER — for tracing cloth
TRACING CLOTH — 36 in.
VAN DYKE
a) Fixing salts
b) Paper, 36 in.
c) Writing fluid

Drafting—Additional Supplies

To be provided by, or for, each student
ERASERS
a) Cleaning
b) Ink
c) Pencil
INK
a) Black, waterproof
b) Colored, if required
PENCILS — DRAWING, HB, 2H, 3H, 4H, and 6H
PENCIL POINTER PAD
THUMBTACKS OR SCOTCH TAPE

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- ☐ Carpentry Mathematics, 2nd Ed. — *Wilson and Rogers.* $2.20
- ☐ Automotive Mechanics — *Crouse.* $3.60
- ☐ Introductory Radio — *Hicks.* $3.20
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- ☐ Basic Television — *Grob.* $5.00

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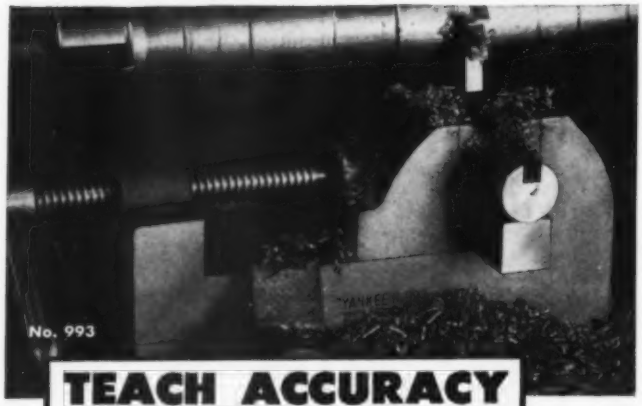

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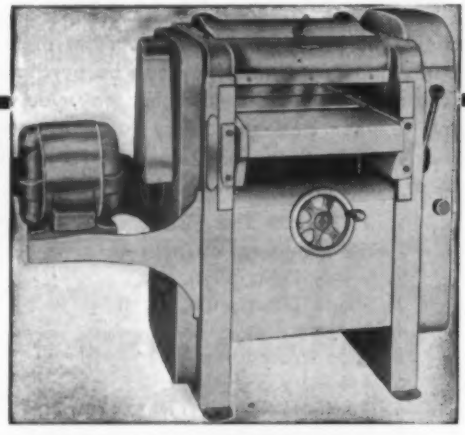

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NEWS NOTES

(Continued from page 73A)

N. Y., in co-operation with the Ithaca Gun Company, reduced eye accidents 75 per cent by a safety program built around a film. The program is described in an article "Safety Celluloid," published in the December issue of *Safety Engineering*.

The safety program was built around the film, "To Live In Darkness," produced by 20th Century Fox for the United States Navy. It effectively tells the story of three men who lost their eyesight through their own carelessness.

The employees of the Ithaca Gun Company, in groups of 20 to 30, were called in during working hours to see the film. The film succeeded in making the employees realize they, personally, had to assume responsibility for the safety of their eyes. With the impact of this realization, a campaign was put into effect immediately. The employees were fitted for safety glasses and goggles. Stations for cleaning glasses were set up throughout the plant.

The result was eye injuries seven months after the film was shown were reduced 75 per cent, compared to eye injuries during the seven months preceding the film.

♦ Ford Motor Company announced recently that it will sponsor a national industrial-arts awards program for junior and senior high school students.

The new Ford program will be a continuation of the industrial-arts awards originated three years ago by *Scholastic Magazine* and will be known as "Ford Motor Company Industrial Arts Awards."

Cash awards for outstanding workmanship and design will be increased over those presented in previous years, the company announced.

The awards will be made by divisions including woodwork, metalwork, mechanical drawing, printing, model making, plastics, machine shop, and electrical work.

Students in industrial arts and vocational classes in all schools, from grades 7 through 12, may enter. Entries are regular class projects made in the school shops under supervision of an instructor.

George H. Fern, director of the awards during its first three years, will continue as consultant on the program. Thirty-six prominent educators from all parts of the country have been invited to continue to serve as an advisory committee.

Rule books and other information will be available by addressing inquiries to Industrial Arts Awards, Ford Motor Company, 3000 Schaefer Road, Dearborn, Mich.

♦ A discussion group on driver education was scheduled for the Kansas City, Mo., meeting of the National Association of Secondary-School Principals, NEA, on February 20, 2:15 p.m., Municipal Auditorium. Chairman of the meeting was Thomas R. Hornor, assistant superintendent in charge of secondary schools, Kanawha County, W. Va.

Burt Johnson, principal, Tenafly, N. J., high school, and Raymond A. Green, principal, Newton High School, Newtonville, Mass., were the speakers. Consultants were R. B. Norman, principal, Amarillo, Tex., high school, and James H. Smith, principal, Lane Technical High School, Chicago.

The Commission also held an exhibit of safety materials in the Municipal Auditorium during the meeting, February 18–22.

♦ The industrial education services in the New York State Education Department, which include the work of about 30 supervisors, have been reorganized into a Division of Industrial and Technical Education under the acting direction of Frank P. Johnston, formerly Chief of the Bureau of Industrial and Technical Education. The Division will now include three bureaus designated as the Bureau of Trade and Technical Education, the Bureau of Occupational Extension and Industrial Service. It will also include the services given to private trade schools and correspondence schools.

Mr. Johnston has been with the State Education Department since 1928, first as supervisor of industrial education in charge of part-time continuation schools, trade and industrial high schools, and apprentice training and trade extension education.

William N. Fenninger, state supervisor of technical education since 1930, has been promoted to acting chief of the Bureau of Trade and Technical Education. Roy G. Fales, state supervisor of industrial arts since 1929, has been promoted to acting chief of the Bureau of Industrial Arts Education.

Nelson J. Murbach, director of vocational education, Batavia, for the past ten years, has been appointed acting chief of the Bureau of Occupational Extension and Industrial Services. Mr. Murbach recently completed work for his doctorate at New York University.

♦ Recommendations for the safe handling of artificially produced radioactive isotopes in the typical laboratory or small industrial operation are concisely set forth in a new handbook, *Safe Handling of Radioactive Isotopes*, just issued by the National Bureau of Standards and now available from the Government Printing Office. This handbook was prepared by the National Committee on Radiation Protection, established by the National Bureau of Standards and drawing members from the medical organizations of the United States, radiation equipment companies, and other Government departments including Public Health, Atomic Energy Commission, and the Military Services.

(Continued on page 86A)

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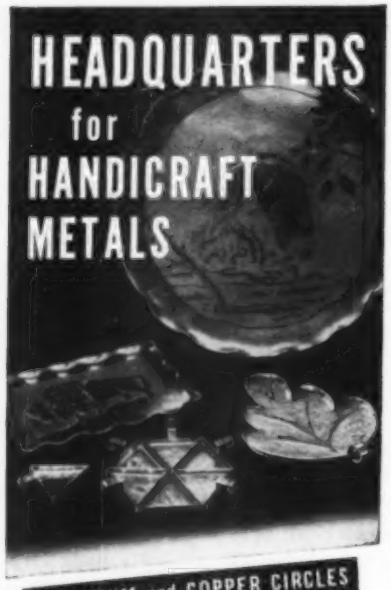

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Shop Equipment News

NEW PRODUCTS — PUBLICATIONS

FLEX-HEAD WRENCHES

Snap-on Tools Corp., Kenosha, Wis., now has available three new Flex-Head wrenches. The construction of these wrenches provides the safety and power of the socket wrench plus greater clearance advantages when working under obstructions.

Flex-head wrench

The double-hexagon, broached heads flex over 180 deg. to give all angles of turning action. With the handle in a vertical position the nut can be spun on and the handle then flexed over for the final tightening. With the handle in a horizontal position little overhead clearance is necessary, making them ideal for work beneath cross members or other obstructions.

These wrenches have different size openings at each end for greater adaptability and are available in the following popular sizes: 3/8 and 7/16 in., 1/2 and 9/16 in., and 5/8 and 3/4 in. Over-all lengths range from 5 5/8 in. for the smallest to 8 3/4 in. for the largest, and all of them are chrome plated.

For further information write to *Snap-on Tools Corp., Kenosha, Wis.*

For brief reference use IAVE—0301.

HAND TAPPER — MODEL H.T. 250

The H. D. Herder Tool Specialties Co., 2424 Brook Drive, Kalamazoo, Mich., has announced a new Hand Tapper — Model H.T. 250. It is a bench-type machine designed for precision small hole tapping. It is primarily intended to be used by tool and die shops, school and service shops, experimental departments, light assembly production plants as well as by model builders, homecrafters, and the like.

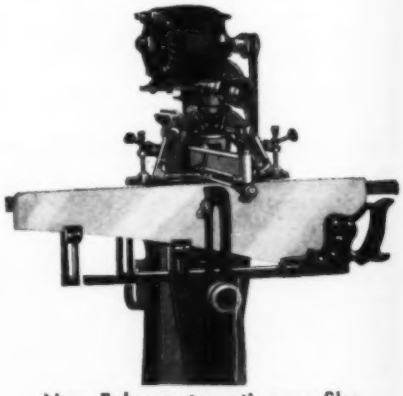
Hand tapper-model

The Model H.T. 250 Tapper insures accurately tapped right angle holes, less tap breakage and increased tap life. Four collets, which handle standard tap shank sizes and taps from No. 0 through 1/4 in., are supplied with each machine. The collets, it is claimed, provide positive drive-through, due to square socket and shank design. A knurled threaded collar (removable by hand) holds and centralizes collet and tap. Either right or left hand taps may be used. The adjustable spindle arm swings to right or left and is quickly positioned for height. Maximum distance from machine base to bottom of tap is 6 in. Two clamps for holding work to base are provided. A spindle is provided with extra long bearing to insure rigidity and long life. Ball and spring tension against the spindle prevent spindle from falling to low position. All parts are machined from gray iron castings and machinery steel. Collets and threaded collar are hardened for long life.

For brief reference use IAVE—0302.

IMPROVED MODEL 61 FOLEY AUTOMATIC SAW FILER

The new Model 61 of the Foley Saw Filer continues the two basic Foley ideas of building *one* machine which will file all hand saws, band saws, and cross-cut circular saws — and of jointing the saw as it is filed to make all teeth uniform in size, height, and spacing.



New Foley automatic saw filer

It is the first Foley Saw Filer to be equipped with Oilite replaceable bearings, for lifetime protection to the main moving parts. A new type socket holder for files permits greater visibility, and a higher lift of the filing arm makes possible greater capacity and use of any size of saw file, from D.E.S.T. files with 7/32-in. face to Diamond Point files with 3/4-in. face, large enough to file and joint coarse 3-point saws. The exclusive jointing action of the Foley is obtained by feeding the saw from the tooth just filed, which automatically brings all teeth to a uniform condition.

For full information on new Model 61 Foley Automatic Saw Filer, write to *Foley Manufacturing Co., 3318 N. E. 5th St., Minneapolis 18, Minn.*

For brief reference use IAVE—0303.

MARVIN MILL ATTACHMENTS

Marvin Machine Products, Inc., of Canton, Ohio, announces the introduction of a line of attachments designed to give greater versatility to bench milling machines. The line includes the Marvin Vertical Mill Attachment, Marvin Slotting Attachment, and the new low-cost Marvin Rotary Table.

The Marvin Vertical Mill Attachment, Model V-1200, is driven from the bench mill spindle, allowing use of the automatic feeds of the ma-

(Continued on page 80A)

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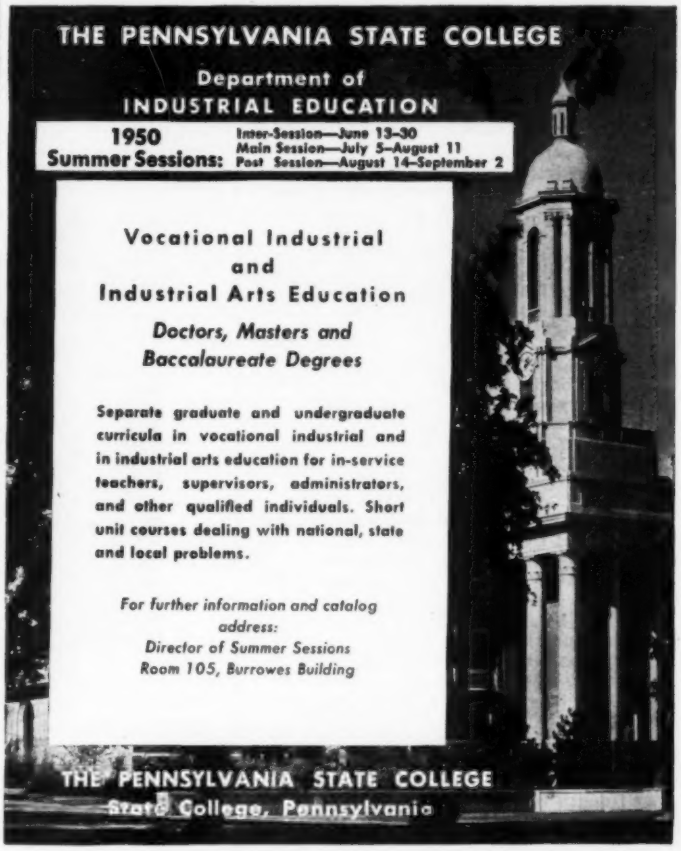

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SHOP EQUIPMENT NEWS

(Continued from page 78A)

chine. It may be attached quickly and easily to the bench mill, can be set at angles, and may be pulled out far past the travel of the table for large overhanging work. Punches, punch holders, die shoes, clutches, molds, and sprockets can be produced with this attachment.

Marvin mill attachment

The unit is machined to slip over a 1½-in. overarm. For other size overarms it may be adapted by using a bushing or turning down a special overarm. Spindle has Timken tapered roller bearings, takes end mills with ⅜ to 1½-in. straight shank, up to ½-in. diameter cutter. Over-all height is 7½ in.

Marvin slotting attachment, Model S-1070, also requires no extra motor. It is attached to the bench mill spindle for making dies, squared or splined holes, internal gears, and many other shapes which cannot ordinarily be made on the bench mill. The S-1070 slotter can be set at angles or pulled out past the travel of the table. It operates quietly and smoothly. Stroke is adjustable from 0 to 2 in., and the holder takes tools having ½-in. shanks. The height is 7½ in., and the width 4¼ in.

The Marvin rotary table, Model R-1102, is a rigid table, proportioned for bench mill or shaper. The 6-in. table is graduated in degrees. It locks from the bottom, assuring against tilting. Worm is hardened and ground, with 40 to 1 ratio. Three 3-in. index plates and handwheels are furnished. Height is 2⅝ in.

For brief reference use IAVE—0304.

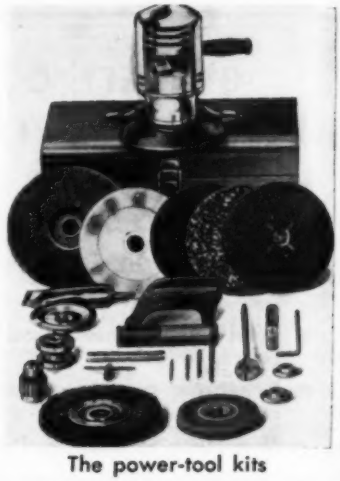
THREE POWER-TOOL KITS

A portable tool line which includes a home kit, a shop kit, and a painter's kit, has been announced recently by the Porter-Cable Machine Co., Syracuse 8, N. Y.

Each kit is built around Porter-Cable's Model D-6 Guild Combo-Tool. This makes it possible by means of attachments to have many types of power tools from the same basic unit. Specially developed accessories equip the Guild Combo-Tool to fill the specialized needs of its particular kit.

In the home kit are attachments which enable the Combo-Tool to polish silver, floors, and furniture; sand and smooth furniture and woodwork; remove paint; sharpen knives and tools; polish the car; and other around-the-house jobs. Also contained in the home kit is a bracket to which the Combo-Tool can be secured, converting it to a bench grinder and buffer.

The shop kit contains attachments which enable the user to grind, sand, drill, wire brush, buff, mix paint, cut metal and tile, smooth off rough edges, and perform other operations. A bench stand also is included in this kit.



The power-tool kits

The painter's kit comes equipped with attachments that make it possible to do countless grades of sanding work, as well as to mix paint, drill, wire brush, cut flashings and pipes, and polish floors.

The Combo-Tool is a portable machine that weighs less than six pounds. Lightweight steel carrying cases are standard equipment for each kit.

For brief reference use IAVE—0305.

WET TOOL GRINDERS

Several new models of the wet grindstones line have just been announced by the Boice-Crane Company, 932 Central Avenue, Toledo 6, Ohio.

In addition to the bench model, which was introduced earlier this year, there are now three new models.

The floor type unit comes complete with ¼-h.p. motor and floor stand. For cabinet shops, carvers, schools, butchers and meat packers a model with two grindstones driven by a single motor and mounted on a bench or floor stand has been developed.

The third new model, hand operated, was produced for field use on farms and plantations, or wherever electricity is not available.

The Boice-Crane Friction-Matic Grinders have a self-adjusting friction drive and have a constant speed throughout their lives. A simplified

(Continued on page 82A)

Wet tool grinder

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SHOP EQUIPMENT NEWS

(Continued from page 80A)

friction roll drive eliminates two pulleys and two bearings. There is no countershaft belt to adjust or replace. The 1-in. steel roller is mounted on a ½-in. diameter shaft.

The peripheral speed remains constant as the wheel wears. Reduction in diameter is automatically compensated for by step-up in wheel rim speed.

The controlled water action on this new grinder prevents water being thrown on the operator, leaving just enough water on the wheel for proper marl consistency.

The tool rest, 2½ by 5 in., is 100 per cent wider than others, permits perfect sharpening of long, slim carving and slicing knives, the wide blades of long handled axes and hatchets, and the widest plane bits and scrapers. This tool rest furthermore makes possible the first wet grinder that permits accurate controls for grinding angles from zero to 30 degrees.

The face of the wheel measures 1½ in., the diameter 8 in. It has a speed of 135 r.p.m. which increases as the wheel wears so as to maintain a peripheral speed of 280 feet per minute. The wheel, which is mounted and trued on a stainless steel shaft, has a useful life far in excess of the ordinary.

The case is of seamless steel. There are four convenient mounting holes in the feet, and the tank, main frame, and tool rest are made of 16-gauge steel, gray enameled.

For brief reference use IAVE—0306.

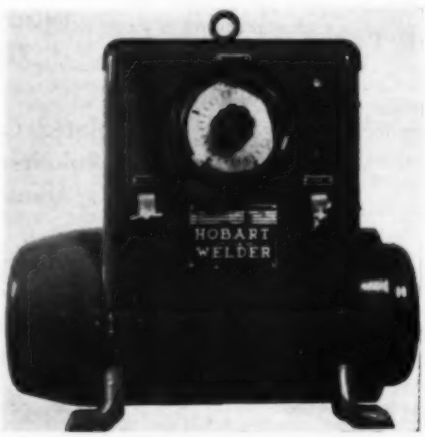
NEW LOW COST D.C. WELDER

A new line of low cost welders has been developed by the Hobart Brothers Company, Box 489, Troy, Ohio, to be known as the "Bantam Champ" D.C. arc welders.

The one shown is the electric motor driven Model MZ-200-S. This model is rated 200 amperes at 30 volts on 50 per cent duty cycle. The current range is from 40 to 250 amperes at an operating speed of 3450 r.p.m. It is 26¼ in. long, 18 in. wide, 25 in. high (stationary), and weighs approximately 340 pounds.

The generator is a modified multi-range type with 4 laminated main poles and 4 interpoles which are removable. Four heavy duty generator brushes are held in a fixed neutral position by patented single unit brush rigging.

Its welding controls are modified multi-range dual control, with 5 ranges of welding current and 100 steps of volt-ampere adjustment in each range, making available 500 combinations of open circuit voltage and welding current for selecting any desired arc characteristics. Main switch is heavy copper, molded in bakelite, controlled by the large, hard-rubber covered hand wheel. Volt-ampere adjuster is compactly built behind the main switch.



Model MZ-200-S motor-driven welder

A squirrel cage induction type electric motor is used and its rotor bars are welded to form a solid copper squirrel cage. The stator is ground concentric with the bearings to insure a uniform air gap.

Voltage change-over terminals are provided on the starting switch. Motor leads are brought out to the terminals on the starting switch and can be reconnected to change from 220 to 440 volts power supply and vice versa.

For brief reference use IAVE—0307.

BLACKHAWK S-15 SERVICE JACK RETURNS TO FIELD

Blackhawk Mfg. Co. announces that their S-15 Service Jack (7½-ton capacity) is being manufactured again.

This model served a majority of bus, truck, and trailer shops before the war because of its compactness and ample capacity.

It handles all vehicles within legal axle load limits of nationwide tonnage laws. The 7½-ton rating makes it just the right size jack for easy handling of every big vehicle that rolls into the shop.

The S-15 has one-piece malleable iron side plates for extra rigidity — an extra high lift of 24¼ in., a "Lightning Lift" speed pump that speeds the saddle to the load and then automatically cuts in the speed pump for steady, easy lifting. It has a three-position handle which gives a full stroke at any position with all controls at the top of the handle. A lock-type release valve prevents anyone from tampering with it.

General specifications of the S-15 are: capacity, 15,000 lb.; low saddle height, 5⅛ in.; hyd. lift, 19⅛ in.; max. saddle height, 24¼ in.; size of

(Continued on page 84A)

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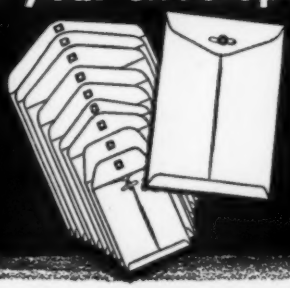

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Write for new Catalog No. 60, describing the complete line of Sterling Foundry Equipment.

Sterling FOUNDRY FLASKS

STERLING WHEELBARROW COMPANY - MILWAUKEE 14 WIS. U.S.A.

SHOP EQUIPMENT NEWS

(Continued from page 82A)

Blackhawk service jack

saddle, 6½ by 8¾ in.; over-all length, 98 in.; weight, 324 lb.

For further information write to the *Blackhawk Manufacturing Co., Blackhawk Distributors, Milwaukee 1, Wis.*

For brief reference use IAVE—0308.

FRANKLIN HIDE GLUE IN TUBES

Liquid hide glue in a new aluminum tube makes it possible to sell glue, like wood and other supplies, instead of paying for it out of the school fund at Worthington High School, Worthington, Ohio.

For the first time in the school's history students can purchase glue along with these other materials, according to H. L. Eisenhart, industrial-arts instructor.

A supply of Franklin liquid glue in tubes is kept in stock and funds from the sale of the item are placed in a revolving fund for industrial-arts supplies. When a student makes a purchase of the glue it is punched out on his regular fee card, thus eliminating a special bookkeeping job.

This glue is manufactured by the Franklin Glue Co., Columbus, Ohio.

For brief reference use IAVE—0309.

NEW DISSTON CIRCULAR SAW BLADES

A new line of circular saw blades for portable electric saws has been announced by Henry Disston & Sons, Inc., Tacony, Philadelphia 35, Pa. The new line is an extension of the Disston DeLuxe Circular Saws, which are widely used in motorized workshops.

The new saws are being marketed through regular wholesale and retail channels.

The saws are made in all popular sizes with center holes bored to fit the individual mandrels of Black & Decker, Mall, Skilsaw, Thor, and Porter Cable electric powered units. The new saws are produced in crosscut, rip and combination types. All of these saws have a high finish and keen teeth, accurately fitted.

For brief reference use IAVE—0310.

CATALOG OF HYDROMATIC MILLING MACHINES

The Cincinnati Milling and Grinding Machines, Inc., Cincinnati 9, Ohio, is offering a new picture-book type of catalog for Hydromatic Milling Machines, No. M-1670.

This well-illustrated booklet shows clearly how the Cincinnati Hydromatic milling machines are built, and how they do the work for which they were made.

A similar catalog on Cincinnati Shapers, Catalog N-5, can also be obtained from the firm.

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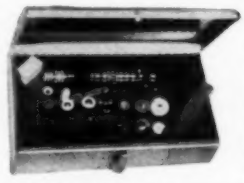

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DIRECTORY OF MANUFACTURERS' PRODUCTS

This directory is published as a convenient guide to sources of supply, covering the products of manufacturers carrying product information in this ANNUAL NUMBER. For alphabetical index of manufacturers' advertising see page 93A. To obtain products not included in this directory, quotations or additional information to help you make up your specifications, lists of equipment, etc., address Industrial-Arts Service Division, or use coupon on page 94A.

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Stanley Tools

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Snap-On Tools, Inc.
South Bend Lathe Works

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South Bend Lathe Works
Walker-Turner Co., Inc.

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Beloit Crane Company
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NEWS NOTES

(Continued from page 77A)

Handbook H42, *Safe Handling of Radioactive Isotopes*, 29 pages, 15 cents a copy, available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

♦ United Air Lines' school and college service department celebrated its tenth anniversary this month. Conceived on February 3, 1940, the department has aided thousands of teachers to meet the needs of air age curricula.

In this 10-year span, the department has produced eight slide films, hundreds of leaflets, maps, picture sets, and other education aids, all made available to schools on a free or free-loan basis. In addition, school and college service annually conducts hundreds of airport tours, actively encourages and participates in summer teacher workshops and in the development of specific air transportation courses such as are offered currently by several leading universities.

♦ The department of welding engineering at Ohio State University has announced completion of a new Patent Classification Index in the A. F. Davis Welding Library, designed to make information on more than 12,000 U. S. patents on welding more easily available to industry and educational institutions.

Each patent in the library is classified or indexed in several different ways — by process, material, product, use, inventor's name, date of issue, etc., on a single keysort card. These cards are sorted mechanically, and in very little time the numbers of patents pertaining to a given field may be determined.

The use of the patent classification system is offered to industrial organizations, individuals, and educational institutions. Services are free of charge to those who make use of the index system in person, but modest charges to defray clerical expense will be made for inquiries handled by mail, Professor Green announced.

♦ The National Association of Manufacturers, 14 West 49th St., New York 20, N. Y., announces the release of their 1949–50 *Listing of Literature and Films*, and related materials. It contains the newest offerings of educational aids to colleges, libraries, and leaders of community groups.

The listing offers virtually all the popularly written booklets and other teaching materials, and an extensive series of more technical research studies and reports on economics, government, labor-management relations, foreign affairs, and other topics of public interest.

Copies of the listing, too, are being supplied free upon request, to teachers of secondary schools who have expressed an interest in the research studies for general reference purposes.

♦ Illinois Institute of Technology is now accepting applications for the 1950 Westinghouse fellowship in power systems engineering, it was announced recently by Dr. W. A. Lewis, dean of the graduate school.

An award of $1,500 and tuition for three semesters of full-time intensive training leading to a master of science degree in electrical engineering is made to the successful applicant.

Candidates must have a bachelor's degree in electrical engineering from an accredited engineering college. The award will be based upon personal qualifications, interest, and scholarship.

Term of the fellowship will begin September, 1950. Applications must be received by March 15. The winner will be announced April 1. Further information and application blanks may be obtained from the Dean of the Graduate School, Illinois Institute of Technology, Chicago 16.

♦ The name of the former Manhattan High School of Women's Garment Trades in New York City has been changed officially to Mabel Dean Bacon Vocational High School.

♦ Armour Research Foundation of Illinois Institute of Technology has announced that it is

(Continued on page 88A)

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Millers Falls Co.
Stanley Tools
Starrett Co., L. S.

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Starrett Co., L. S.

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General Electric Co.

GLASS CUTTER
Red Devil Tools

GLAZING TOOLS
Red Devil Tools

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Franklin Glue Company
Higgins Ink Co., Inc.
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Stanley Tools

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Boice Crane Company
Chicago Wheel & Mfg. Co.
Delta Mfg. Co.
Independent Pneumatic Tool Co.
Rockford Machine Tool Co.
Snap-On Tools, Inc.
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Stanley Tools

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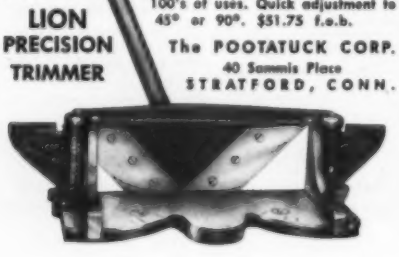

NEWS NOTES

(Continued from page 86A)

offering a limited number of industrial research fellowships in physics, chemistry, metallurgy, ceramics, mechanics, and electrical engineering to begin in September, 1950.

Those men awarded fellowships will attend Illinois Institute of Technology half-time and work in the Research Foundation half-time in a graduate program leading to advanced academic degrees. They are employed full-time by the Foundation during the summer.

Fellowships begin at the commencement of the school semester and continue through the summer for approximately 21 months until the end of the second academic year. Awards are made on a competitive basis to any graduate under 28 years of age holding a bachelor's degree from an accredited engineering or scientific school or liberal arts college with a major in the sciences.

In addition to tuition, fellows receive $150 a month during the first academic year, $275 a month and a two weeks' vacation during the summer, and $175 a month during the second academic year. The Foundation awarded nine fellowships in 1949.

Application forms may be obtained from the Dean of the Graduate School of Illinois Institute of Technology, 3300 South Federal St., Chicago 16, Ill. Applications received prior to March 15 will be given first consideration.

♦ Practical information on the application of electric welding on the farm is contained in a 10-page booklet recently released by the Westinghouse Electric Corporation.

Briefly discussed are the advantages and importance of electric welding to the farmer in solving his machine repair, metal cutting, brazing, and soldering problems. The booklet contains information on the most up-to-date welding procedures and techniques and gives instructions for building time- and money-saving devices.

For a copy of booklet B-4157, write Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa.

♦ The E. I. du Pont de Nemours and Co., Inc., Wilmington 98, Del., announces the award of 76 postgraduate and postdoctoral fellowships to 47 universities for the 1950–51 academic year. An authorization of $224,000 was provided for the awards.

Granting of these fellowships is a continuation of the company's plan originated in 1918 to encourage graduate research in chemistry, physics, metallurgy, and engineering.

The selection of candidates for the fellowships and the choice of problems on which they are to work are, as in the past, left to the universities which receive the awards. Individuals are under no obligation with respect to employment after completing work under this plan.

Each of the postgraduate fellowships provides $1,200 for a single person or $1,800 for a married person, together with an award of $1,000 to the university, for the next academic year. Each of the postdoctoral fellowships provides $3,000 for the recipient and a grant of $1,500 to the university.

♦ A new 16-page catalog featuring the complete C-Thru line, has been issued by The C-Thru Ruler Co. of Hartford, Conn.

The catalog, printed in color, is conveniently indexed for easy reference. Included in the C-Thru line are plastic transparent rulers of many types with the latest additions being a serrated ruler for use by draftsmen, bookkeepers, auditors, attorneys, and others; an Accident Reporting Ruler; and a Steno-Typist Ruler that helps to space and center copy at a glance.

Other items in the catalog include protractors, triangles, lettering guides, ellipses, French curves, slide rules, T squares, yardsticks, and also many plotting and computing instruments.

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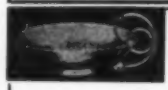

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BY OLD-TIMER BILL GORBIN, 38 YEARS AT LeBLOND

Lots of new lathe hands figure that rough cutting is a hit-or-miss boring process that doesn't call for much brain work. It's probably true that roughing isn't as much of a trick as finishing, but steps are quite important. He's put down to on the subject of proper feeds and speeds.

1. POSITION OF COMPOUND REST FOR ROUGH CUTTING

This is wrong. Slide overhangs too far forward. Puts unnecessary strain on middle of tee slot.

This is wrong, too. Slide overhangs to right. Puts unnecessary strain on middle of tee slot.

This is right. Top slide should be flush with bottom slide to give greatest support to cutting tool.

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2. CUTTING SPEEDS

When using carbide type tools, these figures may be used as a guide. The rigidity of the machine and tool support, interrupted cuts and other variables will make experimentation and adjustments desirable.

3. SLOW DOWN AND FINISH SOONER

There is a tendency for many lathe operators to work their machine far below top efficiency because they fail to take a deep enough cut. Where tool failure is the limiting factor in the size of a roughing cut, it is possible to reduce the speed and increase the feed so that the amount of metal removed is greater than at the faster speed.

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